

# SHIPROCK AIRSTRIP

Shiprock, New Mexico

CONTRACT DOCUMENTS INCLUDING DETAILED SPECIFICATIONS

## **SCHEDULE I**

RECONSTRUCT RUNWAY 2/20 AND CONNECTOR TAXIWAY A

## **SCHEDULE II**

RUNWAY 2/20 AIRFIELD LIGHTING AND SIGNAGE (INCANDESCENT)

## **SCHEDULE II ALTERNATE**

RUNWAY 2/20 AIRFIELD LIGHTING AND SIGNAGE (LED)

## **SCHEDULE III**

HOLDING BAY

AIP No. 3-35-0049-005-2017

NMDOT No. 5V5-17-04

ACI No. 176437

June 2017



**ARMSTRONG**

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# SHIPROCK AIRSTRIP

## SHIPROCK, NEW MEXICO

### Contract Documents including Detailed Specifications

AIP NO. 3-35-0049-005-2017

NMDOT No. 5V5-17-04

ACI NO. 176437

### CERTIFICATION

I hereby certify that these plans and specifications for Shiprock Airstrip Improvements, AIP No. 3-35-0049-005-2017, were prepared under my direct supervision for the Owners thereof.

Designed by:

  
Engineer

7/5/17  
Date

Reviewed by and prepared under my direct supervision:

  
Registered Professional Engineer Date 7/5/2017



### ARMSTRONG CONSULTANTS, INC.

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**INVITATION FOR BIDS  
FOR IMPROVEMENTS TO  
SHIPROCK AIRSTRIP  
SHIPROCK, NEW MEXICO  
AIP NO. 3-35-0049-005-2017  
NMDOT NO. 5V5-17-04**

Sealed bids for improvements to the Shiprock Airstrip, AIP No. 3-35-0049-005-2017, NMDOT No. 5V5-17-04, will be received by the Navajo Nation at Room 129 of the Navajo Department of Transportation, #16 Old Coalmine Road, Mentmore NM 87319 until July 27, 2017 at 2:00 p.m. MST and then opened and read aloud.

The work involved includes the following:

**Schedule I**

Reconstruct Runway 2/20 and Connector Taxiway A

**Schedule II**

Runway 2/20 Airfield Lighting and Signage (Incandescent)

**Schedule II Alternate**

Runway 2/20 Airfield Lighting and Signage (LED)

**Schedule III**

Holding Bay

For a complete set of Plans, Specifications and Contract Documents all purchases must be made through our website at [www.armstrongconsultants.com](http://www.armstrongconsultants.com). A digital copy may be downloaded for \$50.00. A hardcopy may be purchased for \$100.00 for each set. There will be no refunds.

Each bid must be accompanied by a Certified Check or Cashier's Check in an amount not less than five percent of the total bid made payable to Navajo Nation, or by a Bid Bond in like amount executed by a Surety Company.

The Bidder must supply all the information required by the contractor's bid forms and specifications and he/she must bid on all items of every schedule. The Navajo Nation reserves the right to waive any informality in or to reject any or all portions of the various bid items. No contractor's bid may be withdrawn for a period of one hundred twenty (120) days from the opening thereof.

A Pre-Bid meeting will be held at the Shiprock Airstrip on July 20, 2017 at 11:00 a.m. MST. All bidders are advised to examine the site to become familiar with all site conditions.

The proposed contract is under and subject to Executive Order 11246 of 24 September 1965, as amended and to the equal opportunity clause and the Standard Federal Equal Employment Opportunity Construction Contract Specifications, including the goals and timetables for minority and female participation.

A Certification of Nonsegregated Facilities must be submitted prior to the award of the proposed contract, including any subcontracts in excess of \$10,000.00.

The proposed contract is subject to the provisions of Department of Transportation Regulations 49 CFR Part 26 (Disadvantaged Business Enterprise Participation).

Minimum wage rates as established by the Secretary of Labor are applicable to all schedules awarded for this project.

Any questions regarding this project are to be directed to the office of Armstrong Consultants, Inc., NM Office: Albuquerque, New Mexico, (505) 508-2192, for interpretation.

#### SHIPROCK, NEW MEXICO

Albuquerque Journal

Published: July 2, 2017  
July 9, 2017

Farmington Daily Times

Published: July 11, 2017  
July 18, 2017

Navajo Times

Published: July 6, 2017  
July 13, 2017

## **INSTRUCTIONS TO BIDDERS**

### **1. Defined Terms**

Terms used in these Instructions to Bidders, which are defined in the General Provisions of the Construction Contract, have the meanings assigned to them in the General Provisions. The term "Successful Bidder" means the lowest, qualified, responsible Bidder to whom the Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

### **2. Copies of Bidding Documents**

- 2.1 Complete sets of the Bidding Documents in the number and for the deposit sum stated in the Advertisement or Invitation to Bid may be obtained from Engineer (unless another issuing office is designated in the Advertisement or Invitation to Bid). The deposit will not be refunded. Partial sets of Bidding Documents shall not be issued. Portions of the Contract Documents not produced by the Owner or Engineer will not be furnished.
- 2.2 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.3 Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

### **3. Qualifications of Bidders**

- 3.1 Each Bidder may be required to submit written evidence of its qualifications to perform the Work, including but not limited to; financial data, a narrative of previous experience and evidence of authority to conduct business in the jurisdiction where the Project is located. Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located, or covenant to obtain such qualification prior to award of the Contract.

### **4. Examination of Contract Documents and Site**

- 4.1 Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the Work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress, or performance of the Work; and (d) study and carefully correlate Bidder's observations with the Contract Document.
- 4.2 Where any soils investigation or report of subsurface and latent physical conditions at the site or otherwise affecting cost, progress, or performance of the Work which have been relied upon by Engineer in preparing the Drawings and Specifications, for the convenience of the Bidder, the Engineer will make copies of such reports available to any Bidder requesting them. These reports are not guaranteed as to accuracy or completeness, nor are they part of the Contract Documents. Before submitting his Bid, each Bidder will, at his own expense, make such additional

investigations and tests as the Bidder may deem necessary to determine his Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

- 4.3 On request, Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid.
- 4.4 The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Special Provisions, General Provisions, or Drawings.
- 4.5 Drawings and Specifications were prepared on the basis of interpretation, judgment and discretion of Engineer. Accuracy of the Drawings and Specifications cannot be guaranteed. Questions about perceived inconsistencies, ambiguities or errors should be directed to the Engineer. By submitting its Bid, Bidder waives the right to assert that inconsistencies, ambiguities or errors impacted its Bid, Bidder assumes the risk attendance to successful performance of the work, waives all claims for additional compensation or time extensions on the grounds that the nature or amount of work to be done was not understood at the time of Bidding and waives all claims of any nature against the Owner and the Engineer arising out of or related to submission of its bid. The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement of this Article 4 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.
- 4.6 The Bid Set of Drawings and Specifications may have been obtained through a plan room, either physically or through Internet access. Bidder acknowledges that the Engineer has no control over the operation of the plan room. Bidder acknowledges and accepts sole responsibility for obtaining all Bid information, including but not limited to, Addenda which may be issued subsequent to the Original Bid Set.

## **5. Interpretations**

- 5.1 All questions about Contract Documents including Detailed Specifications and/or Construction Plans shall be submitted to Engineer in writing. Questions will be accumulated and a reply will be issued by an Addendum that will then be emailed to all parties recorded by Engineer as having received the Bidding Documents by no later than two (2) days before the scheduled Bid Opening. Questions received less than forty-eight (48) hours prior to the time and date for opening Bids will not be answered. Only questions answered by formal written Addenda will be binding and receipt of all addenda must be properly acknowledged on the appropriate contractor's bid page. If acknowledgement for receiving any of the issued addenda is missing, then your bid will not be accepted. Oral and other interpretations or clarifications will be without legal effect.

## **6. Bid Security**

- 6.1 Bid Security shall be made payable to Owner, in an amount of five percent of the Bidder's total Bid price and in the form of a certified or bank check or a Bid Bond issued by a Surety as assurance that the Bidder will, upon acceptance of his Bid, execute such contractual documents as may be required within the time specified.

- 6.2 The Bid Security of the successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required Contract Security; whereupon, it will be returned; if the successful Bidder fails to execute and deliver the Agreement and furnish the required Contract Security within 10 days of the Notice of Award, Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom the Owner believes to have a reasonable chance of receiving the award may be retained by the Owner until the earlier of the seventh day after the "effective date of the Agreement" or the one-hundred and twenty-first day after the Bid opening. Bid Security of other Bidders will be returned within seven days of the Bid opening.

## **7. Contract Time**

- 7.1 The number of days within which, or the date by which the Work is to be completed, (the Contract Time) is set forth in Article 4.02 of the Agreement and Article 5 of the Special Provisions.

## **8. Liquidated Damages**

- 8.1 Provisions for liquidated damages, if any, are set forth in the Agreement.

## **9. Substitute Material and Equipment**

- 9.1 The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the "effective date of the Agreement." The procedure for submittal of any such application by Contractor and consideration by Engineer is set forth in Section 60, paragraph 3 of the General Provisions that may be supplemented in the Special Provisions.

## **10. Subcontractors**

- 10.1 Contractor's Bid requires that the identity of Subcontractors be submitted to Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, other person or organization, either may, before giving the Notice of Award, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price. If the apparent Successful Bidder declines to make any such substitution, the Contract shall not be awarded to such Bidder, but his declining to make any such substitution will not constitute grounds for sacrificing his Bid Security. Any Subcontractor, other person or organization so listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer.
- 10.2 In contracts where the Contract Price is on the Basis of Cost-of-the-Work Plus a Fee, the apparent Successful Bidder, prior to the Notice of Award, shall identify, in writing to Owner, those portions of the Work that such Bidder proposes to subcontract and after the Notice of Award may only subcontract other portions of the Work with Owner's written consent.

- 10.3 No Contractor shall be required to employ any Subcontractor, other person or organization against which he has reasonable objection.

## **11. Contractor's Bid Form**

- 11.1 The Contractor's Bid Form is attached hereto; additional copies may be obtained from Engineer.
- 11.2 Contractor's Bid Forms must be completed in ink or by typewriter. The Bid price of each item on the form must be stated in words and numerals; in case of a conflict, words will take precedence.
- 11.3 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.
- 11.4 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- 11.5 All names must be typed or printed below the signature.
- 11.6 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).
- 11.7 The address to which communications regarding the Bid are to be directed must be shown.

## **12. Submission of Bids**

- 12.1 Bidders must submit bid forms for all of the work entailed by all of the schedules. A bidder may not submit a bid for some, but not all, of the schedules.
- 12.2 Bids shall be submitted at the time and place indicated in the Advertisement or Invitation to Bid and shall be included in an opaque sealed envelope, marked with the project title and name and address of the Bidder and accompanied by the Bid Security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof. Each Bidder shall prepare his Bid, including supporting data, in duplicate.

Each Bidder will submit the following in a sealed opaque envelope:

- A. The Owner's copy of the Bid and such other items as may be required to accompany the Bid. The entire contract documents book is not required to be submitted.

B. Bid Security.

The outside of the sealed envelope must be clearly marked with Bidder's name and address, the Owner's name and address and the name of the project for which the Bid is being submitted. The Bidder shall retain a duplicate copy of Bid for Bidder's records.

**13. Modification and Withdrawal of Bids**

- 13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

**14. Opening of Bids**

- 14.1 When Bids are opened publicly, they will be read aloud and an abstract of the amounts of the base Bids and major alternates (if any) will be made available within seven (7) days after the opening of Bids.

**15. Bids to Remain Open**

- 15.1 All Bids shall remain open for the period specified in General Provision 30-02, but Owner may, at his sole discretion, release any Bid and return the Bid Security prior to that date.

**16. Award of Contract**

- 16.1 Owner reserves the right to reject any and all Bids, to waive any and all informalities and to negotiate contract terms with the Successful Bidder. The Owner further reserves the right to disregard all nonconforming, nonresponsive, or conditional Bids. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- 16.2 In evaluating Bids, Owner shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements and alternates and unit prices, if requested in the Bid forms. It is Owner's intent to accept alternates (if any are accepted) in the order in which they are listed in the Bid form, but Owner may accept them in any order or combination.
- 16.3 Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the Work as to which the identity of Subcontractors and other persons and organizations must be submitted as provided in the Bid. Operating costs, maintenance considerations, performance data and guarantees of materials and equipment may also be considered by Owner. A Certification of Inclusion of Labor and EEO Requirements in Subcontracts shall be submitted to the Owner for each subcontract.
- 16.4 Owner may conduct such investigations as he deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial

ability of the Bidders, proposed Subcontractors and other persons and organizations to do the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

- 16.5 Owner reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to Owner's satisfaction.
- 16.6 The scope of the project may be revised prior to award depending on the availability of funds. If the Contract is to be awarded, it will be awarded based on the lowest responsive Bid total of the awarded items.
- 16.7 If the Contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within the period specified in General Provision 30-02.

## **17. Performance and Other Bonds**

- 17.1 The party of the second part furnishes concurrently herewith the bonds and insurance required by the Contract Documents, said bonds and insurance having been approved by the Sponsor and attached hereto. The Performance Bond will be in an amount not less than one hundred percent (100%) of the Contract Price but, in any event, shall provide for the completion of the project in accordance with the Contract Documents, without additional cost to the Sponsor. The Payment Bond will be in an amount not less than one hundred percent (100%) of the Contract Price but, in any event, shall provide for the payment of all project costs in accordance with the Contract Documents, without additional cost to the Sponsor. The Maintenance Bond will be so conditioned as to provide for the correction or replacement of any portion of the Work that proves defective in materials or workmanship for a period of one year following final acceptance of the project and shall cover not only the material but also the costs of removal, correction, re-construction and any other costs incurred in the repair of defective portions of the Work. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by the required Contract Security.

## **18. Agreement**

- 18.1 The successful Bidder shall, within 15 days after Notification of the Award:
  - A. Enter into an Agreement, in writing, with Owner covering all matters detailed in these Specifications and his Bid.
  - B. Execute the necessary Bonds with Surety acceptable to the Owner as indicated in the Agreement.
  - C. Show evidence of adequate insurance acceptable to the Owner as defined by the General Provisions and Special Provisions.
  - D. If requested by the Owner, provide a fully detailed financial statement.
- 18.2 The aforesaid Agreement and Bonds shall be subject to approval by the Owner's Attorney. All Bonds are to be furnished at the sole cost of the successful Bidder.

Surety therein provided for shall be a Corporate Surety authorized to do business in the State of Arizona.

- 18.3 The Agreement, when executed, shall be deemed to include the entire Agreement between the parties hereto and the Contractor shall not claim any modification thereof resulting from any representation of the Owner or any other person.

## **19. State and Federal Regulations**

- 19.1 The successful Contractor must fully comply with all applicable Federal and State requirements pertaining to the work, employees used on the job and any special requirements pertaining to work procedures.

## **20. Disadvantaged Business Enterprises (DBE)**

- 20.1 Policy. It is policy of the Department of Transportation (D.O.T.) that Disadvantaged Business Enterprises (DBE's), as defined in 49 CFR Part 26, shall have the maximum opportunity to participate in the performance of Contracts financed in whole or in part with Federal funds under this Agreement. Consequently, the DBE requirements of 49 CFR Part 26 apply to this Agreement.
- 20.2 DBE Obligation. The Contractor or Subcontractor shall not discriminate on basis of race, color, national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in award and administration of D.O.T.-assisted Contracts. Failure by Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as the Sponsor deems appropriate.
- 20.3 Prompt Payment. The Prime Contractor agrees to pay each Subcontractor under this Prime Contract for satisfactory performance of its Contract no later than 10 days from receipt of each payment the Prime Contractor receives from the Sponsor. The Prime Contractor further agrees to return retainage payments to each Subcontractor within 10 days after the Subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Sponsor. This clause applies to both DBE and non-DBE Subcontractors.
- 20.4 Contract Goals. The Bidder shall Subcontract 5.0% percent of the dollar value of the total amount of a D.O.T.-assisted Contract to qualified DBE Contractors. Based on the 9<sup>th</sup> Circuit Court Decision in Western States Paving Company v. Washington State Department of Transportation, The Navajo Nation has determined that it is appropriate to use a race/gender neutral goal. The Navajo Nation encourages all bidders to take active race gender/neutral steps to include DBE's in this and other airport contracts. Race/gender neutral steps include: unbundling large contract, subcontract work the prime contractor may self-perform, provide bonding or financing assistance, provide technical assistance, etc. This contract can be awarded without the lowest responsive bidder meeting the goal or demonstrating good faith effort to meet the goal.

20.5 DBE Contractors or Subcontractors. At the time of bid, the Bidder shall submit:

- A. The names and addresses of DBE firms that will participate in the contract;
- B. A description of work that each DBE will perform;
- C. The dollar amount of the participation of each DBE firm;
- D. Written and signed documentation of commitment to use the DBE Subcontractor whose participation it submits to meet a Contract goal;
- E. Written and signed confirmation from the DBE that it is participating in the Contract as provided in the Prime Contractor's commitment;

20.6 Good Faith Efforts. (DELETED)

20.7 Bidders List. The bidder shall submit the name, address, DBE status, age and gross receipts of all firms bidding or quoting subcontractors on D.O.T.-assisted projects.

**21. Notice of Requirement for Affirmative Action – 41 CFR Part 60-2**  
(BID NOTICE) – 41 CFR PART 60-4.2 (VERSION 1, 1/5/90)

21.1 The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

21.2 The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables:

Goals for Minority participation for each 45.9%

Goals for Female participation for each trade 6.9%

These goals are applicable to all the Contractor's Construction work (whether or not it is Federal or Federally-assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its Federally involved and Nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the Contract and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project, for the sole purpose of meeting the Contractor's goals, shall be a violation of the

Contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- 21.3 The Contractor shall provide written notification to the Director OFCCP, within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address and telephone number of the Subcontractor; employer identification number of the Subcontractor; estimated dollar amount of the Subcontract; estimated starting and completion dates of Subcontract; and the geographical area in which the Subcontract is to be performed.
- 21.4 As used in this notice and in the Contract resulting from this solicitation, the "covered area" is the State of Arizona.

**22. Notice to Prospective Federally Assisted Construction Contractors**  
41 CFR 60-1.8 (VERSION 1, 5/1/90)

- 22.1 A Certification of Nonsegregated Facilities shall be submitted prior to the award of a Subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause.
- 22.2 Contractors receiving Federally-assisted Construction Contract Awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective Subcontractors for supplies and Construction Contracts where the Subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

**23. Notice to Prospective Subcontractors of Requirements for Certification of Nonsegregated Facilities**

- 23.1 A Certification of Nonsegregated Facilities shall be submitted prior to the award of a Federally-assisted Construction Contract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause.
- 23.2 Contractors receiving Subcontract Awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective Subcontractors for supplies and Construction Contracts where the Subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

CERTIFICATION TO BE SUBMITTED BY FEDERALLY ASSISTED CONSTRUCTION CONTRACTORS AND THEIR SUBCONTRACTORS (APPLICABLE TO FEDERALLY ASSISTED CONSTRUCTION CONTRACTS AND RELATED SUBCONTRACTS EXCEEDING \$10,000 WHICH ARE NOT EXEMPT FROM THE EQUAL OPPORTUNITY CLAUSE)

**24. Standard Federal Equal Employment Opportunity Construction Contract Specifications (41 CFR 60-4.3) (VERSION 1, 1/5/90)**

**24.1 As used in these specifications:**

- A. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
- B. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;
- C. "Employer Identification Number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;
- D. "Minority"
  - 1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
  - 2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
  - 3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
  - 4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

**24.2** Whenever the Contractor, or any Subcontractor at any tier, Subcontracts a portion of the Work involving any construction trade, it shall physically include in each Subcontract in excess of \$10,000 the provisions of these Specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this Contract resulted.

**24.3** If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

- 24.4 The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these Specifications. The goals set forth in the solicitation from which this Contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction Contractors performing construction work in a geographical area where they do not have a Federal or Federally-assisted Construction Contract shall apply the minority and female goals established for the geographical area where the Work is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
- 24.5 Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.
- 24.6 In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the Contractor during the training period and the Contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.
- 24.7 The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these Specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:
- A. Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
  - B. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available and maintain a record of the organizations' responses.
  - C. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female

referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if the referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

- D. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement was not referred to the Contractor a minority person or female sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- E. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
- F. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- G. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed and disposition of the subject matter.
- H. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- I. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written

notification to organizations, such as the above, describing the openings, screening procedures and tests to be used in the selection process.

- J. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
- K. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- L. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- M. Ensure that seniority practices, job classifications, work assignments and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- N. Ensure that all facilities and company activities are nonsegregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- O. Document and maintain a record of all solicitations of offers for subcontracts from minority and female Construction Contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- P. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

24.8 Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

- 24.9 A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female and all women, both minority and nonminority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally,) the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.
- 24.10 The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- 24.11 The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- 24.12 The Contractor shall carry out such sanctions and penalties for violation of these Specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing Subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these Specifications and Executive Order 11246, as amended.
- 24.13 The Contractor, in fulfilling its obligations under these Specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with these requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
- 24.14 The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
- 24.15 Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

**25. Buy American – Steel and Manufactured Products for Construction Contracts**  
(JAN 1991, Amended September 2007)

25.1 The Aviation Safety and Capacity Expansion Act of 1990 provides that preference be given to steel and manufactured products produced in the United States when funds are expended pursuant to a grant issued under the Airport Improvement Program. The following terms apply:

- A. Steel and manufactured products. As used in this clause, steel and manufactured products include (1) steel produced in the United States or (2) a manufactured product produced in the United States, if the cost of its components mined, produced or manufactured in the United States exceeds 60 percent of the cost of all its components and final assembly has taken place in the United States. Components of foreign origin of the same class or kind as the products referred to in subparagraphs (b) (1) or (2) shall be treated as domestic.
- B. Components. As used in this clause, components means those articles, materials and supplies incorporated directly into steel and manufactured products.
- C. Cost of components. This means the costs for production of the components, exclusive of final assembly labor costs.

25.2 Buying goods produced in the United States

- A. Preference. The Secretary of Transportation may obligate an amount that may be appropriated to carry out section 106 (k), 44502 (a)(2), or 44509, subchapter I of chapter 471 (except section 47127), or chapter 481 (except section 48102 (e), 48106, 48107 and 48110) of this title for a project only if steel and manufactured goods used in the project are produced in the United States.
- B. Waiver. The Secretary may waive subsection (a) of this section if the Secretary finds that
  - 1) Applying subsection (a) would be inconsistent with the public interest;
  - 2) The steel and goods produced in the United States are not produced in a sufficient and reasonably available amount or are not of satisfactory quality.
  - 3) When procuring a facility or equipment under section 44502 (a)(2) or 44509, subchapter I of chapter 471 (except section 47127), or chapter 481 (except sections 48102 (e), 48106, 48107 and 48110) of this title.
    - a) The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components of the facility or equipment; and

b) Final assembly of the facility or equipment has occurred in the United States; or

4) Including domestic material will increase the cost of the overall project by more than 25 percent.

C. Labor Costs. In this section, labor costs involved in final assembly are not included in calculating the cost of components.

25.3 The successful bidder will be required to assure that only domestic steel and manufactured products will be used by the Contractor, Subcontractors, materialmen and suppliers in the performance of this Contract, except those-

A. that the U.S. Department of Transportation has determined, under the Aviation Safety and Capacity Expansion Act of 1990, are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality;

B. that the U.S. Department of Transportation has determined, under the Aviation Safety and Capacity Expansion Act of 1990, that domestic preference would be inconsistent with the public interest; or

C. that inclusion of domestic material will increase the cost of the overall project contract by more than 25 percent.

**CONTRACTORS BID  
FOR  
IMPROVEMENTS TO  
SHIPROCK AIRSTRIP  
SHIPROCK, NEW MEXICO  
AIP NO. 3-35-0049-005-2017  
NMDOT NO. 5V5-17-04**

**\*\*BIDDERS TO SUBMIT PAGES P-1 THROUGH P-13 WITH BID\*\***

TO: Navajo Nation  
P.O. Box 4620  
Window Rock, Arizona 86515

The undersigned Bidder, having examined the Plans, Specifications and other Contract Documents as designated and all Addenda thereto; having investigated the location of and conditions affecting the Proposed Work; and being acquainted with and fully understanding the extent and character of the Work covered by this Bid and all factors and conditions affecting or which may be affected by the Work;

HEREBY PROPOSES, pursuant to the Invitation for Bids published July 2, 6, 9, 11, 13 & 18, 2017, to furnish all required materials, tools, equipment and plant; to perform all necessary labor and superintendence; and to undertake and complete the Work required for Shiprock Airstrip, AIP No. 3-35-0049-005-2017, NMDOT No. 5V5-17-04, in Shiprock, New Mexico, in full accordance with Plans, Specifications and Contract Documents hereto attached or by reference made a part thereof, at and for the following prices:

**BID SCHEDULE**

"Unit Prices" are to be handwritten or typed in both words and figures. In case of discrepancy, the amount shown in words will govern.

"Unit Prices" bid shall not include 6.5625% New Mexico Gross Receipts Tax. This tax will be included in each payment to the Contractor. The Contractor is responsible for paying this Gross Receipts Tax to the State of New Mexico.

"Unit Prices" bid shall not include 5.0% Navajo Nation Tax. This tax will be included in each payment to the Contractor. The Contractor is responsible for paying this Gross Receipts Tax to the Navajo Nation.

SCHEDULE I – RECONSTRUCT RUNWAY 2/20 AND CONNECTOR TAXIWAY A						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
1	S-1	Mobilization	1	LS	\$	\$
2	S-2a	Pulverize Asphalt Mat (3 inches)	44,880	SY	\$	\$
3	S-2b	Remove and Dispose Asphalt Mat (3 inches)	825	SY	\$	\$
4	S-2c	Remove Existing Lighting System and Appurtenances	1	LS	\$	\$
5	S-2d	Remove Existing Culverts	235	LF	\$	\$
6	S-2e	Remove and Replace Entrance Gate	1	LS	\$	\$
7	S-6	Watering	INCIDENTAL		INCIDENTAL	
8	P-151	Clearing and Grubbing	INCIDENTAL		INCIDENTAL	
9	P-152a	Unclassified Excavation (Runway)	1,265	CY	\$	\$
10	P-152b	Unclassified Excavation (Taxiway)	630	CY	\$	\$
11	P-152c	Shoulder/RSA Grading	6,740	CY	\$	\$
12	P-154a	Subbase Course (6 inches, Mixed in Place, Runway)	47,789	SY	\$	\$
13	P-154b	Subbase Course (6 inches, Mixed in Place, Taxiways)	2,481	SY	\$	\$
14	P-156	Temporary Air and Water Pollution, Soil Erosion and Siltation Control	INCIDENTAL		INCIDENTAL	

SCHEDULE I – RECONSTRUCT RUNWAY 2/20 AND CONNECTOR TAXIWAY A						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
15	P-208	Crushed Aggregate Base Course (6 inches)	50,270	SY	\$	\$
16	P-401a	Bituminous Surface Course (4 inches) (50 Blow)	11,656	TON	\$	\$
17	P-401b	Bituminous Material (PG 70-22)	810	TON	\$	\$
18	P-602	Bituminous Prime Coat	15,085	GAL	\$	\$
19	P-603	Bituminous Tack Coat	INCIDENTAL		INCIDENTAL	
20	P-610	Structural Portland Cement Concrete	INCIDENTAL		INCIDENTAL	
21	P-620a	Runway and Taxiway Markings	26,830	SF	\$	\$
22	P620-b	Reflective Media, Type I, Gradation A	1,635	LB	\$	\$
23	D-701a	24-inch RCP Culvert	235	LF	\$	\$
24	D-701b	24-inch RCP End Sections	4	EA	\$	\$
25	L-101	Airport Rotating Beacon	1	EA	\$	\$
26	L-103	Beacon Tower and Foundation	1	EA	\$	\$
27	L-107	12-Foot Wind Cone and Segmented Circle, in place	1	EA	\$	\$
28	L-108c	No. 12 AWG THWN-2 Cable, Installed in Conduit (Beacon)	30	LF	\$	\$
29	L-108d	Bare No. 12 Ground Wire, Installed in Conduit (Beacon)	10	LF	\$	\$

SCHEDULE I – RECONSTRUCT RUNWAY 2/20 AND CONNECTOR TAXIWAY A						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
30	L-108e	No. 6 AWG THWN-2 Cable, Installed in Conduit (Wind Cone)	350	LF	\$	\$
31	L-108f	Bare No. 8 Ground Wire, Installed in Conduit (Wind Cone)	170	LF	\$	\$
32	L-109a	Vault Building and Foundation, Complete in Place	1	LS	\$	\$
33	L-109b	10 KW Regulator and Control Equipment, Complete in Place	1	LS	\$	\$
34	L-110a	Airport Underground Electrical Duct Bank 2-Way 4-Inch PVC (Concrete Encased)	330	LF	\$	\$
35	L-110b	Airport Underground Electrical Conduit Bank 2-Inch PVC (DEB) (Beacon)	10	LF	\$	\$
36	L-110c	Airport Underground Electrical Conduit Bank 2-Inch PVC (DEB) (PAPI)	3,820	LF	\$	\$
37	L-125f	Splice Base (PAPI/Wind Cone)	12	EA	\$	\$
38	L-125g	Retroreflective Marker	20	EA	\$	\$
39	L-132	L-881 Precision Approach Path Indicator, (PAPI-2) System	2	EA	\$	\$
40	T-901	Seeding	13	ACRE	\$	\$
<b>TOTAL BID AMOUNT – SCHEDULE I</b>					\$	

SCHEDULE II – RUNWAY 2/20 AIRFIELD LIGHTING AND SIGNAGE (INCANDESCENT)						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
1	L-108a	No. 8 AWG, L-824, Type C Cable, Installed in Conduit (Edge Lights)	12,600	LF	\$	\$

SCHEDULE II – RUNWAY 2/20 AIRFIELD LIGHTING AND SIGNAGE (INCANDESCENT)						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
2	L-108b	Bare No. 6 Counterpoise Wire, Installed in Trench, Including Ground Rods and Ground Connectors	11,415	LF	\$	\$
3	L-110d	Airport Underground Electrical Conduit 2-Inch PVC (DEB) (MIRL)	11,200	LF	\$	\$
4	L-125a	24-Inch Base-Mounted Medium Intensity Runway Edge Light	51	EA	\$	\$
5	L-125b	24-Inch Base Mounted Medium Intensity Threshold Light	16	EA	\$	\$
6	L-125c	Lighted Guidance Sign (2 Module)	4	EA	\$	\$
7	L-125d	Lighted Guidance Sign (3 Module)	1	EA	\$	\$
8	L-125e	Splice Base (MIRL)	10	EA	\$	\$
<b>TOTAL BID AMOUNT – SCHEDULE II</b>					\$	

SCHEDULE II ALTERNATE – RUNWAY 2/20 AIRFIELD LIGHTING SIGNAGE (LED)						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
1	L-108a	No. 8 AWG, L-824, Type C Cable, Installed in Conduit (Edge Lights)	12,600	LF	\$	\$
2	L-108b	Bare No. 6 Counterpoise Wire, Installed in Trench, Including Ground Rods and Ground Connectors	11,415	LF	\$	\$
3	L-110d	Airport Underground Electrical Duct Bank 2 Inch PVC (DEB) (MIRL)	12,275	LF	\$	\$
4	L-125a	Base-Mounted LED Medium Intensity Runway Edge Light	51	EA	\$	\$
5	L-125b	Base Mounted LED Medium Intensity Threshold Light	16	EA	\$	\$

SCHEDULE II – RUNWAY 2/20 AIRFIELD LIGHTING AND SIGNAGE (INCANDESCENT)						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
6	L-125c	LED Lighted Guidance Sign (2 Module)	4	EA	\$	\$
7	L-125d	LED Lighted Guidance Sign (3 Module)	1	EA	\$	\$
8	L-125e	Splice Base (MIRL)	10	EA	\$	\$
<b>TOTAL BID AMOUNT – SCHEDULE IIA</b>					\$	

SCHEDULE III – HOLDING BAY						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
1	S-2a	Pulverize Asphalt Map (3 inches)	470	SY	\$	\$
2	S-6	Watering	INCIDENTAL		INCIDENTAL	
3	P-151	Clearing and Grubbing	INCIDENTAL		INCIDENTAL	
4	P-152d	Unclassified Excavation (Holding Bay)	1,310	CY	\$	\$
5	P-154c	Subbase Course (6 inches, Mixed in Place, Holding Bay)	470	SY	\$	\$
6	P-154d	Subbase Course (6 inches, Holding Bay)	2,690	SY	\$	\$
7	P-156	Temporary Air and Water Pollution, Soil Erosion and Siltation Control	INCIDENTAL		INCIDENTAL	
8	P-208	Crushed Aggregate Base Course (6 inches)	3,160	SY	\$	\$
9	P-401a	Bituminous Surface Course (4 inches, 50 Blow)	730	TON	\$	\$
10	P-401b	Bituminous Material (PG 70-22)	55	TON	\$	\$

SCHEDULE III – HOLDING BAY						
Item No.	Spec. No.	Description	Est. Qty.	Unit	Unit Price in Figures/Writing	Total Price
11	P-602	Bituminous Prime Coat	950	GAL	\$	\$
12	P-603	Bituminous Tack Coat	INCIDENTAL		INCIDENTAL	
13	P-610	Structural Portland Cement Concrete	INCIDENTAL		INCIDENTAL	
14	P620a	Runway and Taxiway Markings	1,730	SF	\$	\$
15	P-620b	Reflective Media, Type I, Gradation A	105	LB	\$	\$
16	D-701c	18-inch RCP Culvert	195	LF	\$	\$
17	D-701d	18-inch RCP End Sections	2	EA	\$	\$
18	L-108a	No. 8 AWG L-824, Type C Cable, Installed in Conduit (Edge Lights)	520	LF	\$	\$
19	L-108b	Bare No. 6 Counterpoise Wire, Installed in Trench, Including Ground Rods and Ground Connectors	520	LF	\$	\$
20	L-110a	Airport Underground Electrical Duct Bank 2-Way 4-Inch PVC (Concrete Encasement)	170	LF	\$	\$
21	L-110d	Airport Underground Electrical Duct Bank 2-Inch PVC (DEB) (MIRL)	350	LF	\$	\$
22	L-125e	Splice Base (MIRL)	21	EA	\$	\$
23	L-125g	Retroreflective Marker	7	EA	\$	\$
24	L-125h	Lighted Guidance Sign (1 Module) (LED for Incandescent based on Schedule I)	2	EA	\$	\$
<b>TOTAL BID AMOUNT – SCHEDULE III</b>					\$	

## EQUAL EMPLOYMENT OPPORTUNITY STATEMENT

A Bidder must have properly completed this form to be considered an eligible Bidder.

The Bidder shall complete the following statement by checking the appropriate boxes.

The Bidder *has* ☐ *has not* ☐  
participated in a previous contract subject to the equal opportunity clause prescribed by Executive Order 10925, Executive Order 11114, or Executive Order 11246.

The Bidder *has* ☐ *has not* ☐  
submitted all compliance reports in connection with any such contract due under the applicable filing requirements; and that representations indicating submission of required compliance reports signed by Proposed Subcontractors will be obtained prior to Award of Subcontracts.

If the Bidder has participated in a previous Contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Bidder shall submit a compliance report on Standard Form 100, 'Employee Information Report EEO-1' prior to the Award of Contract.

**DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION:** The undersigned has satisfied the requirements of the specifications in the following manner (please check the appropriate space):

☐ The Bidder is committed to a minimum of 5.0 % DBE utilization on this Project.

☐ The Bidder (if unable to meet the goal of 5.0 % DBE) is committed to a minimum of \_\_\_\_\_ % DBE utilization on this Project and has submitted documentation showing good faith effort.

Contractor: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature) (Title)

Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Zip Code: \_\_\_\_\_

## LETTER OF INTENT

Name of Bidder's Firm: \_\_\_\_\_

Bidder's Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Name of DBE Firm: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Telephone (including area code): \_\_\_\_\_

Description of work to be performed by DBE firm:

[illegible]

Bidder intends to utilize the above-named minority firm for the work described above. The estimated amount of work is valued at \$\_\_\_\_\_.

**If the above-named Bidder is not determined to be the successful Bidder, the Letter of Intent shall be null and void.**

(Copy this page for each minority subcontractor)

## BIDDERS LIST

The Bidder shall submit the following information for all firms Bidding or quoting Subcontracts on D.O.T.-assisted Projects.

Project Title: \_\_\_\_\_

Date: \_\_\_\_\_

Prime Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

Phone/Fax: \_\_\_\_\_

Name of Firm	Address	Type of Work to be Performed on Contract	Certified DBE		Date Firm Established	AGR*
			YES	NO		

**\*AGR – Annual Gross Receipts**

Enter 1 for Less than \$1 Million

Enter 2 for More than \$1 Million, Less than \$5 Million

Enter 3 for More than \$5 Million, Less than \$10 Million

Enter 4 for More than \$10 Million, Less than \$15 Million

Enter 5 for More than \$15 Million

## CERTIFICATION OF NONSEGREGATED FACILITIES

The Federally Assisted Construction Contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments and that he does not permit his employees to perform their services at any location under his control, where segregated facilities are maintained. The Federally Assisted Construction Contractor agrees to, that a breach of this certification is a violation of the Equal Opportunity Clause in this Contract.

As used in this certification the term "segregated facilities" means waiting room, work areas, rest rooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas. Transportation and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or any other reason. The Federally Assisted Construction Contractor agrees that (except where he has obtained identical certifications from Proposed Subcontractors for specific time periods) he will obtain identical certifications from Proposed Subcontractors prior to the Award of Subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that he will retain such certifications for his files.

### CERTIFICATION:

The information above is true and complete to the best of my knowledge and behalf.

Contractor/Subcontractor

\_\_\_\_\_  
(Name of Firm)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

## **Certification requirements for procurement of steel or manufactured products.**

If steel, iron, or manufactured products (as defined in §§661.3 and 661.5 of this part) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder or offeror in accordance with the requirement contained in §661.13(b) of this part.

[71 FR 14117, Mar. 21, 2006, as amended at 72 FR 53696, Sept. 20, 2007]

### **Buy America Certification (Title 49 U.S.C. Section 50101)**

<b>Airport Name</b>	Shiprock Airstrip
<b>AIP No.</b>	3-35-0049-005-2017
<b>NMDOT No.</b>	5V5-17-04
<b>Schedule I</b>	Reconstruct Runway 2/20 and Connector Taxiway A
<b>Schedule II</b>	Runway 2/20 Airfield Lighting and Signage (Incandescent)
<b>Schedule II Alternate</b>	Runway 2/20 Airfield Lighting and Signage (LED)
<b>Schedule III</b>	Holding Bay

This solicitation and any resulting contract are subject to the Buy America requirements of 49 U.S.C. Section 50101. The bidder certifies it and all associated subcontractors will comply with the Buy American preferences established under Title 49 U.S.C. Section 50101 as follows:

### **U.S.C. Section 50101 - Buying goods produced in the United States**

- (a) Preference. - The Secretary of Transportation may obligate an amount that may be appropriated to carry out section 106(k), 44502(a)(2), or 44509, subchapter I of chapter 471 (except section 47127), or chapter 481 (except sections 48102(e), 48106, 48107, and 48110) of this title for a project only if steel and manufactured goods used in the project are produced in the United States.
- (b) Waiver. - The Secretary may waive subsection (a) of this section if the Secretary finds that –
- (1) Applying subsection (a) would be inconsistent with the public interest;
  - (2) The steel and goods produced in the United States are not produced in a sufficient and reasonably available amount or are not of a satisfactory quality;
  - (3) When procuring a facility or equipment under section 44502(a)(2) or 44509, subchapter I of chapter 471 (except section 47127), or chapter 481 (except sections 48102(e), 48106, 48107, and 48110) of this title –
    - A. The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components of the facility or equipment; and
    - B. Final assembly of the facility or equipment has occurred in the United States; or

- (4) Including domestic material will increase the cost of the overall project by more than 25 percent.
- (c) Labor Costs. - In this section, labor costs involved in final assembly are not included in calculating the cost of components.

Please note that approval of waivers listed under (b) (1) & (2) above, can only be approved by the FAA Office of Airports in Washington DC and approval is rare. Waivers listed under (b) (3) & (4) may be approved by FAA Regional or District Offices. A listing of Equipment and Products that have been approved and on the national waiver list may be located at: [http://www.faa.gov/airports/aip/procurement/federal\\_contract\\_provisions/media/buy\\_american\\_waiver.xls](http://www.faa.gov/airports/aip/procurement/federal_contract_provisions/media/buy_american_waiver.xls)

As a matter of bid responsiveness, the bidder or offeror must complete and submit this certification with their bid proposal. The bidder must sign and date the certification. The bidder/offeror must indicate how they propose to comply with the Buy America provision by selecting one of the following certification statements.

- ☐ **The bidder hereby certifies that it will comply with Title 49 U.S.C Section 50101(a) by only installing steel and manufactured products produced in the United States of America. The bidder further agrees that if chosen as the apparent low bid, it will submit documentation to the owner that demonstrate all steel and manufactured products are 100% manufactured in the United States.**
- ☐ **The bidder hereby certifies that it cannot fully comply with the Buy America preferences of Title 49 U.S.C Section 50101(a); the bidder therefore requests a waiver per Title 49 U.S.C Section 50101(b). The bidder further agrees that upon notification from the Owner, the bidder identified with the apparent low bid agrees to prepare and submit a waiver request and component calculation information to the owner within \_\_\_\_\_ calendar days of the date of the notice of apparent low bid.**

\_\_\_\_\_  
*Bidder's Firm Name*

\_\_\_\_\_  
*Date*

\_\_\_\_\_  
*Signature*

#### ***Certification Regarding Debarment Suspension, Ineligibility and Voluntary Exclusion***

The bidder/offeror certifies, by submission of this bid or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this bid that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/offeror/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/bid.

BIDDER acknowledges receipt of the following ADDENDUM:

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The submission of a BID will constitute an incontrovertible representation by the BIDDER that he is familiar with conditions of the site as well as with the work required.

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for unit prices or lump sum as shown on the BID SCHEDULE. The Bidder further agrees that no Bid may either be changed or withdrawn without consent of the Owner for a period of one hundred twenty (120) days after the scheduled time for opening the Bids.

The undersigned Bidder hereby agrees to be ready and to appear at the office of the President to execute the attached Agreement in conformity with this Bid and also to have ready and furnish the required Proofs of Insurance and Bonds, executed by a Surety Company acceptable to the Owner's Attorney at any time within fifteen (15) days from the date of a Notice of Award, mailed to the address hereinafter given.

Enclosed herewith is a Bid Security as defined in the attached Instructions to Bidders in the amount of \_\_\_\_\_, which Bid Security the undersigned Bidder agrees is to be paid to and become the property of the Owner as liquidated damages and not as a penalty, for the delay and extra work caused hereby, should the Bidder prevent an award as defined in the Instructions to Bidders, or should the Bid be accepted and Contract awarded him and he fails to enter into Agreement in the form prescribed and to furnish the required proofs of insurance and bonds within fifteen (15) days as stipulated.

**SIGNATURE OF BIDDER**

Dated at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, 2017.

**IF AN INDIVIDUAL:**

Name: \_\_\_\_\_

By: \_\_\_\_\_  
(Signature of Individual)

Doing Business as: \_\_\_\_\_

Business Address: \_\_\_\_\_

\_\_\_\_\_

Telephone Number: \_\_\_\_\_

(If Bidder is a Corporation or Joint Venture, sign on next page)

**IF A CORPORATION:**

Corporation Name: \_\_\_\_\_

By: \_\_\_\_\_  
(Authorized Signature)

Name and Title: \_\_\_\_\_

Business Address: \_\_\_\_\_ (CORPORATE SEAL)

\_\_\_\_\_

Telephone Number: \_\_\_\_\_

ATTEST:

By: \_\_\_\_\_  
(Authorized Signature)

Name and Title: \_\_\_\_\_

**IF A JOINT VENTURE:**

Joint Venture Name: \_\_\_\_\_

By: \_\_\_\_\_  
(Authorized Signature)

Name and Title: \_\_\_\_\_

Business Address: \_\_\_\_\_

\_\_\_\_\_

Telephone Number: \_\_\_\_\_

Joint Venture Name: \_\_\_\_\_

By: \_\_\_\_\_  
(Authorized Signature)

Name and Title: \_\_\_\_\_

Business Address: \_\_\_\_\_

\_\_\_\_\_

Telephone Number: \_\_\_\_\_

## AFFIDAVIT OF NON-COLLUSION

for \_\_\_\_\_ services for the \_\_\_\_\_ Project  
architectural, engineering, design-build, construction, etc. description of project  
located in the \_\_\_\_\_ Chapter of the Navajo Nation

State of \_\_\_\_\_) ss.

County of \_\_\_\_\_)

Affiant: \_\_\_\_\_, being first duly sworn, hereby deposes and says:

1. that he/she is the \_\_\_\_\_ of \_\_\_\_\_, the Business Entity  
owner, partner, officer, representative, agent company, firm, partnership, etc.  
that has submitted/is submitting to the Navajo Nation a Proposal or Statement of Qualifications (SOQ) or Bid for the above named Project;
2. that Affiant is fully informed with respect to the preparation and contents of the Proposal/SOQ/Bid submitted by said Business Entity for the above-named Project, and with respect to all pertinent circumstances regarding the submission of said Proposal/SOQ/Bid to the Navajo Nation;
3. that he/she is authorized to represent said Business Entity for purposes of the declarations set forth herein, and that all such declarations are made on behalf of said Entity and all of its owners, partners, officers, members, employees, officials, agents, or parties-in-interest;
4. that said proposal/SOQ/bid is genuine and not collusive or sham;
5. that said Entity has not in any manner colluded, conspired, connived, or agreed, directly or indirectly, with any other entity, bidder, or person, to submit a sham Proposal/SOQ/Bid to the Navajo Nation in connection with the proposed Contract for which said Proposal/SOQ/Bid was submitted, or to refrain from submitting a Proposal/SOQ/Bid to the Navajo Nation in connection with the proposed Contract;
6. that said Entity has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any other entity, bidder, or person, to fix any price, relating to any Proposal/SOQ/Bid of Entity or of any other entity, bidder, or person, or to fix any price, overhead, profit, reimbursement, or cost element of said Proposals/SOQ/Bid, or of that of any other entity, bidder, or person;
7. that said Entity has not -through any collusion, conspiracy, connivance, or unlawful written or oral agreement- secured any advantage against the Navajo Nation or against any other entity, bidder or person interested in the proposed Contract for the above-named Project;
8. that all statements set forth herein, and in said Proposal/SOQ/Bid submitted to the Navajo Nation, are true.

signature of Affiant: \_\_\_\_\_

printed name of Affiant: \_\_\_\_\_

title of Affiant: \_\_\_\_\_

name of Business Entity: \_\_\_\_\_

type of Entity (LLC, Partnership, etc.): \_\_\_\_\_

address of Business Entity: \_\_\_\_\_

Business Entity's EIN: \_\_\_\_\_

**NOTARY:**

**Subscribed and sworn to before me this** \_\_\_\_\_

**day of** \_\_\_\_\_, 20\_\_.

**Notary**  
**Signature** \_\_\_\_\_

**My commission expires** \_\_\_\_\_, 20\_\_.

**NOTICE OF AWARD  
FOR  
AIP NO. 3-35-0049-005-2017  
NMDOT No. 5V5-17-04  
SHIPROCK AIRSTRIP**

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The OWNER has considered the Bid submitted by you for the above described Work in response to its Invitation for Bids and Instructions to Bidders.

You are hereby notified that your Bid has been accepted in the amount of \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

You are required by the Instructions to Bidders to execute the Agreement and furnish the required Contractor's Performance, Payment and Maintenance Bonds and Proofs of Insurance within fifteen (15) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said Bonds and Proofs of Insurance within fifteen (15) days from the date of this Notice, said Owner will be entitled to consider your Bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the Owner.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2017.

NAVAJO NATION  
(Owner)

By \_\_\_\_\_, President  
Address: P.O. Box 4620  
Window Rock, Arizona 86515

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE OF AWARD is hereby acknowledged by:

\_\_\_\_\_, Contractor

By: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_ Telephone: \_\_\_\_\_

**THIS PAGE INTENTIONALLY LEFT BLANK**

**AGREEMENT  
BETWEEN OWNER AND CONTRACTOR  
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)**

THIS AGREEMENT is by and between \_\_\_\_\_ (“Owner”) and  
\_\_\_\_\_ (“Contractor”).

Owner and Contractor hereby agree as follows:

**ARTICLE 1 – WORK**

- 1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

**ARTICLE 2 – THE PROJECT**

- 2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Schedule I: Reconstruct Runway 2/20 and Connector Taxiway A

Schedule II: Runway 2/20 Airfield Lighting and Signage (Incandescent)

Schedule II Alternate: Runway 2/20 Airfield Lighting and Signage (LED)

Schedule III: Holding Bay

**ARTICLE 3 – ENGINEER**

- 3.01 The Project has been designed by Armstrong Consultants, Inc.
- 3.02 The Owner has retained Armstrong Consultants, Inc. (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

**ARTICLE 4 – CONTRACT TIMES**

- 4.01 *Time of the Essence*

A. All time limits for Milestones, if any, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

- 4.02 *Contract Times: 60 Days*

A. The Work will be fully completed within 60 (sixty) days after the date when the Contract Times commence to run as provided in the Notice to Proceed, unless an extension of time is granted by the Sponsor in accordance with the provisions of Section 80, paragraph 7, General Provisions.

#### 4.03 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
  - 1. Contractor shall pay Owner \$2,500.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above until the Work is complete.

### ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

- A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

### ARTICLE 6 – PAYMENT PROCEDURES

#### 6.01 *Submittal and Processing of Payments*

- A. As provided for in Article 14 of Exhibit B

#### 6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment when funds are received from the FAA and/or NMDOT as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
  - 1. Prior to the completion of the Work, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
    - a. 90 percent of Work completed (with the balance being retainage).

#### 6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price as recommended by Engineer.

### ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of 0 percent per annum.

## ARTICLE 8 – CONTRACTOR’S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
  - B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
  - C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
  - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
  - E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor’s safety precautions and programs.
  - F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
  - G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
  - H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
  - I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
  - J. Contractor’s entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

## **ARTICLE 9 – CONTRACT DOCUMENTS**

### **9.01    *Contents***

- A. The Contract Documents consist of the following:
  - 1. This Agreement (pages 1 to 7, inclusive).
  - 2. Exhibit B, “Modified Navajo Nation Supplemental General Conditions for FAA Projects
  - 3. Construction Performance and Maintenance bond (pages PER-1 to PER-2, inclusive).
  - 4. Construction Payment bond (pages PAY-1 to PAY-2, inclusive).
  - 5. Certification of Inclusion of Labor and EEO Requirements in Subcontracts (page CI-1, inclusive).
  - 6. Navajo, State, and Federal Clauses
  - 7. FAA General Provisions
  - 8. Technical Specifications as listed in the table of contents of the Contract Documents Including Detailed Specifications.
  - 9. Construction Drawings and Construction Safety and Phasing Plan
  - 10. Special Provisions
  - 11. Davis Bacon Wage Rates
  - 12. Addenda (numbers \_\_\_\_ to \_\_\_\_, inclusive).
  - 13. Notice of Award
  - 14. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor’s Bid (pages \_\_\_\_ to \_\_\_\_, inclusive).
  - 15. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    - a. Notice to Proceed.
    - b. Contract Change Orders.
    - c. Field Orders
    - d. Application for Payment
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented by a duly executed written instrument.

## **ARTICLE 10 – MISCELLANEOUS**

### **10.01    *Terms***

- A. Terms used in this Agreement will have the meanings stated in the General Provisions.

10.02 *Assignment of Contract*

- A. Assignment of this Contract is prohibited under Article 26 of Exhibit B.

10.03 *Successors and Assigns*

- A. As provided for in Article 26 and 27 of Exhibit B.

10.04 *Severability*

- A. As provided for in Article 30 of Exhibit B.

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
  - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
  - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
  - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on \_\_\_\_\_ (which is the Effective Date of the Contract).

OWNER:

CONTRACTOR:

\_\_\_\_\_  
The Navajo Nation

\_\_\_\_\_

By: \_\_\_\_\_  
Russell Begaye

By: \_\_\_\_\_

Title: \_\_\_\_\_  
President

Title: \_\_\_\_\_

*(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest: \_\_\_\_\_

Attest: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Address for giving notices:

Address for giving notices:

\_\_\_\_\_  
P.O. Box #4620

\_\_\_\_\_

\_\_\_\_\_  
Window Rock, AZ 86515

\_\_\_\_\_

License No.: \_\_\_\_\_  
*(where applicable)*

*(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*

*NOTE TO USER: Use in those states or other jurisdictions where applicable or required.*

*Agent for service of process:*

Contract has been reviewed and determined to be In Accordance with Navajo Nation Law.

\_\_\_\_\_

**MODIFIED NAVAJO NATION SUPPLEMENTAL GENERAL CONDITIONS FOR FAA PROJECTS**

**Navajo Nation Administrative Purposes Only**

*The Parties acknowledge the terms within this box section are referenced in the Contract but are for Navajo Nation governmental purposes. Except as provided in the Contract, changes to the terms within this box section will not require a modification.*

**Contract Number:** \_\_\_\_\_

**Contract Begin Date:** \_\_\_\_\_

**Contract Term Ends:** \_\_\_\_\_

**Business Unit Number(s)**                      **Amount to Encumber**

\$

**1.0 IDENTIFICATION OF THE PARTIES; PROJECT.** This Contract is entered into by and between the Navajo Nation and \_\_\_\_\_, who is hereinafter referred to as "Contractor." The Navajo Nation and Contractor are herein jointly referred to as "Parties." The authorized representatives for both Parties are named in the Primary Contract. The Project that is the subject of this Contract is the "**Schedule I – Reconstruct Runway 2/20 and Connector Taxiway A; Schedule II – Runway 2/20 Airfield Lighting and Signage (Incandescent); Schedule II Alternate – Runway 2/20 Airfield Lighting and Signage (LED); Schedule III – Holding Bay.**" hereinafter referred to as "the Project."

**2.0 DOCUMENTS CONSTITUTING THE CONTRACT.** The following:

2.1 the EJCDC C-520 ©2013 - SUGGESTED FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACTS (STIPULATED PRICE), as modified by the Parties;

2.2 Exhibit B – this "Modified Navajo Nation Supplemental General Conditions for FAA Projects"; are to be considered collectively as one agreement/contract and the term "Contract" whenever used herein shall be deemed to include all such documents.

**3.0 CONTRACT DOCUMENTS & NNSGC GOVERN.** The Parties hereby acknowledge and agree that the written provisions contained in the documents listed in Article 2.0 herein constitute the complete understanding of the Parties with respect to the subject matter of this Contract, and that there are no promises or representations between the Parties other than those set forth herein. Any conflict between any provision(s) contained in the Contract documents shall be resolved by reference to and interpretation of the provision(s) contained in this Navajo Nation Supplemental General Conditions.

**4.0 ORIGINAL CONTRACT AMOUNT:** [Written Amount] (\$0.00), which amount is the Original Contract Amount. Any modification of this amount shall comply with Article 32 herein. The Contractor hereby acknowledges and agrees that said payment constitutes the full and adequate consideration for all work fully and satisfactorily performed, for all applicable taxes, permit fees, licensing fees, registration fees, bonding and surety costs, insurance or any other expenses necessary or convenient for the Contractor to perform under this Contract.

5.0 **PRIMARY WORK LOCATION.** In the performance of work or provision of services pursuant to this Contract the Contractor is authorized to travel at Contractor's sole expense. The work to be performed and/or services to be provided shall be primarily in Shiprock, NM.

6.0 **AVAILABILITY OF FUNDS.**

6.1 **Appropriations required.** Pursuant to 2 N.N.C. §223 A, the obligation of the Navajo Nation to pay Contractor the entire Original Contract Amount, or any portion thereof as invoiced, or any amounts under any and all change orders, amendments, or modifications to this Contract, shall be contingent upon the availability of funds, from whatever source, for the Project which is the subject of this Contract.

6.2 **Subsequent fiscal periods.** Pursuant to 12 N.N.C. §350 D, if funds adequate to support continuation of performance under this Contract are not appropriated or otherwise become unavailable during any fiscal period(s) subsequent to that period in which this Contract is entered into, then this Contract may, at the sole discretion of the Navajo Nation, be cancelled and Contractor shall be reimbursed only for the reasonable value of any non-recurring costs incurred as a direct result of work performed under this Contract.

7.0 **CONTRACT NUMBER.** Upon contract execution, the Navajo Nation shall assign a Contract Number which shall be shown in the Administrative Purposes box on page 1 herein. All invoices submitted by Contractor for payment shall reference said Contract Number, including the Project Name and Business Unit Number.

8.0 **EFFECTIVE DATE; TERM, NOTICE TO PROCEED REQUIRED.** The effective beginning and ending date of this Contract are as shown on the first page of the Primary Contract. The Contractor shall not commence any work until the Navajo Nation Division of Transportation issues a formal "Notice to Proceed" for the Project; notwithstanding, the Contractor shall not commence any work until the effective date of all insurance required by Article 9 herein. This Contract shall expire on the date shown unless earlier terminated or extended by modification in accordance with Article 32 herein.

9.0 **INSURANCE REQUIREMENTS.** The Contractor shall, at its sole expense, procure and maintain adequate and sufficient insurance for all of Contractor's potential liabilities, in accordance with this Article, relating to any claims by any party for any injury to persons or damage to property arising out of or connected with any work performed or services provided under this Contract by the Contractor.

9.1 **Minimum Insurance Coverages.** The Contractor shall obtain and maintain for the duration of performance under this Contract, the minimum insurance coverages shown below:

- (a) **Commercial General Liability – ISO CG 0001 Form or equivalent.** Coverages shall include:
  - Premises and Operations
  - Personal/Advertising Injury
  - Products/Completed Operations
  - Liability assumed under an Insured Contract (including defense costs assumed under contract)
  - Broad Form Property Damage
  - Independent Contractors/Consultants
- (b) **Automobile Liability including all:**
  - Contractor-Owned Vehicles
  - Non-owned Vehicles
  - Rented/Hired Vehicles
  - Personal Injury Protection (where applicable)

- (c) **Workers' Compensation:**
- Statutory Benefits (Coverage A)
  - Employers Liability (Coverage B)

- 9.2 **Limits required.** Contractor shall carry the limits of liability as required below (where "State Law" is indicated, such limits shall be in accordance with the laws and regulations of the State wherein this Contract shall be primarily performed):

COMMERCIAL GENERAL LIABILITY	
GENERAL AGGREGATE	\$ 2,000,000
PRODUCTS/COMPLETED OPERATIONS AGGREGATE	\$ 2,000,000
OCCURRENCE BASIS/ PER EACH OCCURRENCE LIMIT	\$ 1,000,000
PERSONAL/ADVERTISING INJURY	\$ 1,000,000
FIRE DAMAGE (ANY ONE FIRE)	\$ 50,000
MEDICAL PAYMENTS (ANY ONE PERSON)	\$ 5,000
AUTOMOBILE LIABILITY	
BODILY INJURY/PROPERTY DAMAGE (EACH ACCIDENT)	\$ 1,000,000
PERSONAL INJURY PROTECTION (IF APPLICABLE)	BY STATE LAW
WORKERS' COMPENSATION	
COVERAGE A (WORKERS' COMPENSATION)	BY STATE LAW
COVERAGE B (EMPLOYERS LIABILITY)	\$ 500,000

- 9.3 All policies must be written on a "per-occurrence" basis, unless otherwise approved by the Navajo Nation Risk Management Program.
- 9.4 **Claims-made basis.** In the event that Contractor's liability insurance required by this Contract is written on a claims-made basis, the Contractor shall warrant that any retroactive date under the policy shall precede the effective date of this Contract, and that either continuous coverage will be maintained or an extended discovery period will be exercised for a period of two (2) years beginning as of the date that performance under this Contract is completed.
- 9.5 **Primary coverage basis.** For payment of any claims, Contractor's insurance coverage shall be on a primary, non-contributory basis with any other insurance coverages and/or self-insurance carried by the Navajo Nation or all other available sources.
- 9.6 **Required language.** The Contractor's General Liability and Umbrella Liability policy shall be endorsed to include the following language: "The Navajo Nation, its elected officials, employees, agents, and volunteers are named as an Additional Insured with respect to liability arising out of the activities performed by the Insured [the Contractor] pursuant to a Contract with the Navajo Nation." (ISO Forms CG 2010 and CG 20 37 "Additional Insured-Owners, Lessees or Contractors-Completed Operations, 2004 Editions or equivalent).
- 9.7 **Waiver of subrogation.** All Contractor's policies shall contain a waiver of subrogation in favor of the Navajo Nation, its divisions, departments, offices, agencies, boards, commissions, committees, enterprises and its employees, officers, officials, and agents for losses arising from work performed or services provided by the Contractor pursuant to a Contract with the Navajo Nation.

- 9.8 **Separation of Insureds.** The Contractor's policy shall include a "Separation of Insureds" clause (Cross Liability).
- 9.9 **Insurer rating.** The Contractor's insurance policy shall be issued by a licensed or approved insurer with an "A.M. Best" rating of not less than A- VII. The Navajo Nation in no way warrants that the above-required minimum insurer rating is sufficient to protect the Contractor from potential insurer insolvency.
- 9.10 **Certificates of insurance.** The Contractor shall provide to the Navajo Nation certificates of insurance as required by this Contract. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. Each insurance policy required by this Contract must be in effect upon, or prior to, commencement of performance under this Contract and shall remain in effect until such time as all of its obligations under this Contract or any subsequent modifications have been fully and satisfactorily completed. Insurance certificates shall be sent to the Navajo Nation Department of Risk Management, P.O. Box 1690, Window Rock, Arizona, 86515. The Contract Number and a description of the work performed or services provided thereunder shall be indicated on such certificates.
- 9.11 **Subcontractors.** The Contractor's subcontractors, if any, shall be included as insureds under the Contractor's policy, or the Contractor shall provide to the Navajo Nation separate certificates and endorsements for each of its subcontractors holding separate policies. All coverages for subcontractors shall be subject to the minimum policy amounts shown herein.
- 9.12 **Notification of change required.** The insurance policy required herein shall provide the required coverage and shall not be suspended, voided, canceled, or reduced in coverage or in limits except after thirty (30) calendar days prior written notice has been given to the Navajo Nation. Such notice shall be sent in accordance with Article 20.0 herein.
- 9.13 **Approval of modifications.** Any modification of the insurance requirements set forth herein shall be approved by the Navajo Nation Risk Management Program, whose decision shall be final. Such modification shall not require a formal Contract modification, but may be approved by administrative action of the Risk Management Program. The Contractor may request, for itself or its subcontractors, that the insurance requirements shown herein be modified, provided that such request be delivered in writing to the Risk Management Program at least ten days prior to the solicitation due date or, if not a solicitation, prior to contract execution or modification. The Contractor shall include with such request a justification for the modification with supporting documentation. Any modifications approved shall on a case-by-case basis and shall not affect the insurance requirements of other subcontractors for whom modifications have not been approved. Any deviations from the standard types and coverages set forth herein shall be approved by the Navajo Nation Risk Management Program prior to the issuance of a Notice to Proceed.
- 9.14 **Navajo Nation disclaimers.** The insurance requirements and coverages set forth herein are minimum requirements only and in no way limit the indemnity covenants contained in this Contract. The Navajo Nation in no way warrants that the minimum limits herein are sufficient to protect the Contractor or its' subcontractors from any liabilities that might arise from the work performed or services provided under this contract, and the Contractor and its subcontractors are free to purchase additional insurance. By requiring such minimum insurance, the Navajo Nation shall not be deemed to have assessed the risk that may be applicable to the Contractor under the Contract. The Contractor shall assess its own risks and if it deems appropriate and/or prudent, it may maintain higher limits and/or broader coverages. The Contractor is not relieved of any liability or other obligations assumed or pursuant to this Contract by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types.

- 9.15 **No sovereign immunity waiver.** The Parties acknowledge and agree that the Navajo Nation is relying on, and does not waive or intend to waive by any provision of this Contract, the monetary limitations and other rights, immunities, and protections provided under 1 N.N.C. §§551 et. seq., as from time to time amended, or otherwise available to the Navajo Nation or its elected officials, employees, agents, and volunteers.
- 9.16 **Mutual cooperation.** The Navajo Nation and Contractor shall cooperate in good faith in the collection of any insurance proceeds which may be payable in the event of any loss, including the execution and delivery of any proof of loss or other actions required to effect recovery.
- 9.17 **Insurance documentation required.** The Navajo Nation's Representative must receive written documentation of all required insurance prior to the issuance of a Notice to Proceed for the Project, and the Contractor shall not commence any work to be performed or services to be provided under this Contract unless and until such documentation has been submitted to the Navajo Nation. If the Contractor is able to furnish such documentation prior to the Navajo Nation's execution of this Contract, such documentation shall be made an Attachment to the Primary Contract. The Navajo Nation may terminate this Contract for breach if the Navajo Nation's Representative determines that the Contractor has failed to submit the required documentation in a timely manner and that the Navajo Nation is unable to issue a Notice to Proceed in a timely manner.
- 10.0 **BUILDER'S RISK INSURANCE.** The Contractor shall obtain, on behalf of the Navajo Nation, a "Builder's Risk" insurance policy for all aspects of the Project; such insurance coverage shall be in amount adequate to cover any potential loss, relating to the Project or any portion thereof, that may occur prior to the effective date and time of the Navajo Nation's property insurance coverage for the Project.
- 11.0 **BONDING REQUIREMENTS.**
- 11.1 **Performance Bond.** The Contractor shall provide to the Navajo Nation a Performance Bond underwritten and executed by a surety company that guarantees the Contractor's complete and satisfactory performance under the Contract. The Performance Bond shall be equal to one-hundred percent (100%) of the Original Contract Amount.
- 11.2 **Payment Bond.** The Contractor shall provide to the Navajo Nation a Payment Bond underwritten and executed by a surety company that will protect all persons, subcontractors, or other entities supplying labor and material to the Contractor or its subcontractors for the performance under this Contract. The Payment Bond shall be in an amount equal to one-hundred percent (100%) of the Original Contract Amount. The Payment Bond must be provided in addition to the Performance Bond required in Article 11.1 herein.
- 12.0 **LICENSING & REGISTRATION REQUIREMENTS.**
- 12.1 **State license required.** The Contractor shall hold a current and valid license from an appropriate State Licensing Board or Agency for the type of work and location of the work to be performed under this Contract, which license is customarily maintained in the industry. Said License must be maintained as active and current for the entire duration of performance under this Contract. The Contractor shall indicate its business name, business address, "Qualifying Party," and state license number in the Primary Contract. Regardless of who the "qualifying party" is, the Contractor agrees to immediately notify the Navajo Nation if such license is suspended, revoked, expired, or otherwise not in effect.
- 12.2 **Business registration required.** The Contractor shall be registered to do business with the State in which the Project is located. All documents regarding such registration shall be provided to the Navajo

Nation prior to the execution of this Contract, and must be active and valid for the effective duration of this Contract. The Contractor shall immediately notify the Navajo Nation if such registration is suspended, revoked, expired, or otherwise not in effect.

- 12.3 **Documentation required.** The Contractor shall submit written documentation of all required licenses and registrations to the Navajo Nation's Representative. The Navajo Nation may terminate this Contract for material breach if the Navajo Nation's Representative determines that the Contractor has failed to timely submit the required documentation.
- 12.4 **Licensed subcontractors required.** All subcontractors used by the Contractor in its performance under this Contract shall be duly registered and licensed to practice their professions in the Navajo Nation and/or the State in which the Project is located. Use of unregistered or unlicensed subcontractors shall constitute a material breach and the Navajo Nation may terminate this Contract.
- 13.0 **RIGHT TO REFUSE CONTRACT.** The Navajo Nation reserves its right to refuse to execute this Contract upon a written determination that any of the following has occurred prior to the Nation's execution of this Contract:
- 13.1 **faulty procurement;** a document, procedure, decision, action, or other event pertaining to the procurement of this Contract, or to any related pre-procurement activities, is in violation of any applicable Navajo Nation, federal, or state laws or regulations governing said procurement; or
- 13.2 **ancillary firm(s);** an ancillary firm is ineligible for the award of this Contract or is unavailable to perform on the Project, for any reason; in such case, the Navajo Nation may, in its discretion, either (1) reject the selected Proposal containing the ancillary firm's qualifications and refuse to execute this Contract; or (2) decide not to reject the Proposal and consider only the license and relevant qualifications of the Contractor standing alone; or (3) decide not to reject the Proposal and permit another equally/more qualified firm to perform those Contract services that would have been performed by the ineligible or unavailable firm; or
- 13.3 **lack of funding availability;** when funding for the Scope of Work has become wholly or partially unavailable; or
- 13.4 **change to SOW or other requirements;** the Scope of Work or any other mandatory requirement is required to be changed significantly; or
- 13.5 **change to Budget/MFP;** there has been a revision (whether increase or decrease) of the budget or Maximum Feasible Price that was originally established by the Navajo Nation prior to the initiation of the procurement process for this Contract; or
- 13.6 **protest filed;** a protest has been timely filed in accordance with 12 N.N.C. §360(A), unless a determination has been made to proceed with a Contract award pursuant to 12 N.N.C. §360(F); or
- 13.7 **other reasons cited in Regulations;** any of the following pertains to this procurement:
- .1 inadequate or ambiguous specifications were cited in the RFP/RSQ;
  - .2 the services contemplated under this Contract are no longer required;
  - .3 the RFP/RSQ did not provide for consideration of all factors of cost to the Navajo Nation
  - .4 all Proposals received indicate that the needs of the Navajo Nation can be satisfied by a less expensive service differing from that described in the RFP/RSQ;
  - .5 all fee Proposals received exceed the Maximum Feasible Price after opportunity for negotiation pursuant to 12 N.N.C. §346(D);

- .6 the selected Proposal was collusive, contained fraudulent statements or information, contained any material misrepresentation, or was submitted in bad faith;
- .7 cancellation of proposed Contract serves in the best interest of the Navajo Nation.

**14.0 PROJECT SUPERVISION; AUTHORIZATION OF PAYMENTS.**

**14.1 Navajo Nation's Representative.** In the performance of work or provision of services under this Contract, the Contractor shall at all times be under the supervision and direction of the Nation's representative named in the Primary Contract, or his/her successor or designee.

**14.2 Payment approval required.** No payment shall be authorized or remitted to the Contractor unless and until the Navajo Nation's Representative, or his/her successor or designee, approves in writing in advance the work performed or services provided under this Contract, and has given prior written approval of invoice(s), billing(s), or payment application(s) submitted to the Navajo Nation. All invoices must be supported by adequate verification, documentation, and itemization of all required Project deliverables received by the Navajo Nation.

**14.3 Joint supervision and approval.** Any cooperative or joint supervision, or joint approval authority involving person(s) other than the Navajo Nation's Representative, whether Navajo Nation staff or other person(s), shall be conducted through a duly approved and executed cooperative agreement that sets forth the extent of decision-making, supervision, and approval authority of the Navajo Nation's Representative and such other person(s).

**14.4 Subcontractor Expenses.** The Contractor shall be solely responsible for all consideration, compensation, taxes, fees or any other expenses whatsoever, related to the Contractor's use of any subcontractors, agents, representatives, employees or consultants in the performance of Contractor's obligation under this Contract.

**15.0 TAXES.** Contractor acknowledges and agrees that all work performed and services provided within the territorial jurisdiction of the Navajo Nation is subject to the five percent (5%) Navajo Sales Tax (24 N.N.C. §601 *et seq.*).

**15.1 Identification of taxable activity.** The Contractor shall separately indicate, on each invoice or payment application submitted to the Navajo Nation, any and all of its work performed or services provided within the Navajo Nation pursuant to this Contract, and shall itemize the Navajo Sales Tax.

**15.2 Withholding.** The Contractor acknowledges and agrees that the Navajo Nation shall withhold from each payment five percent (5%) of the amount associated with work performed or services provided within the Navajo Nation under this Contract, and shall transfer such five percent (5%) amount to the Office of the Navajo Tax Commission (ONTC) on behalf of the Contractor. The Contractor shall indicate on its quarterly tax return filed with the ONTC that the Navajo Sales Tax has been withheld and paid.

**15.3 Filing and other payments.** The Contractor acknowledges that the Navajo Nation's withholding of tax in no way removes Contractor's responsibility for timely filing of tax returns and payment of interest, penalties, or any other amounts relating to Contractor's tax obligations under the Navajo Nation's or any other jurisdiction.

**16.0 RETAINAGE.**

**16.1 Percentage withheld.** Contractor agrees that the Navajo Nation shall withhold ten percent (10%) of the payment due under each invoice submitted to the Navajo Nation, as Retainage.

- 16.2 **Legal release required.** The retainage balance shall not be released until the Contractor submits a "Release of All Claims and Liens" which is notarized and signed by the Contractor, and also submits all similar legal releases of subcontractors.
- 17.0 **SUBMITTAL OF FINAL INVOICES & WORK PRODUCT.** Copies of all work product documents, reports, photographs, drawings, schematics, related correspondence, invoices, and other information or documents regarding the Project shall be provided to the Nation's Representative no later than thirty (30) calendar days following the expiration or termination of this Contract. Final invoice(s) shall be due no later than thirty (30) calendar days following the expiration or termination of this Contract.
- 18.0 **DEBTS OWED; RIGHT TO OFFSET.** The Contractor acknowledges that pursuant to the Navajo Business and Procurement Act, 12 N.N.C. §§ 1501 *et seq.*, the Contractor, in its present form or in any other identifiable capacity as an individual, business, corporation, partnership, or other entity, is eligible to do business with the "Navajo Nation" as defined in 12 N.N.C. §1503(A). Contractor further acknowledges that if the Contractor has an outstanding money judgment against it in favor of the Navajo Nation, or there exists a delinquent accounts receivable debt which is due and owing to the Navajo Nation by Contractor, then the Navajo Nation may, upon due notice to the Contractor, offset its money claim against any amount owed for work performed or services provided under this Contract.
- 19.0 **PRIVATE CONTRACTOR.** The Contractor shall perform and conduct all activities under this Contract as a private independent Contractor and shall not be considered an employee of the Navajo Nation or receive any benefits to which the Navajo Nation's employees are entitled.
- 20.0 **ISSUANCE OF NOTICES; MAILINGS.** Any notices or correspondence relating to this Contract sent by either Party to the other shall be mailed to the address shown on the front page of the Primary Contract, shall be mailed via certified U.S.P.O. mailing with return receipt requested, and shall be deemed issued or submitted to the receiving Party as of the date of such certified mailing.
- 21.0 **REQUESTS FOR INFORMATION.** When requested by the Navajo Nation, Contractor shall submit proper verification of invoices, pay applications, reports, documents or any other information related to this Contract within fourteen (14) calendar days of the date of the request.
- 22.0 **RECORDS; AUDITS.** Pursuant to 12 N.N.C. §352, Contractor shall keep and maintain books, records, documents or other materials related to performance under this Contract for a period of five (5) calendar years from the date of issuance of final payment under this Contract. Upon issuance of a Notice of Audit to Contractor, the Navajo Nation may audit such documents and records any time during the effective period of this Contract, up to the five (5) calendar year period following final payment. Contractor agrees to have an authorized individual execute and have notarized a release authorizing the Navajo Nation to release the Contractor's ledgers, books, records, documents or other materials related to performance under this Contract, as such information may be required by a governmental agency under an agreement with the Navajo Nation for purposes of an audit by such agency of such documents and records. Contractor agrees that said executed release shall constitute permission for disclosure of information pursuant to 2 N.N.C. §85 (A)(5)(d) and 2 N.N.C. §86(C).
- 23.0 **NAVAJO NATION OWNERSHIP OF WORK PRODUCT.** All intangible and intellectual property or work product that is produced by the Contractor or any of its subcontractors, which work product is embodied in any tangible medium such as notes, plans, or drawings, including the overall form as well as the arrangement and composition of spaces and elements in the medium, and is produced for purposes of fulfilling any duties

under this Contract, shall be and remain the property of the Navajo Nation at all times, whether or not such product is completed or certified, and may be used by the Navajo Nation, except as follows:

**23.1 Limited disclosure.** Said property shall not be distributed or disclosed to any party other than the Navajo Nation or its divisions, departments, offices, agencies, boards, commissions, committees, enterprises, employees, officers, officials, and agents, except (1) upon prior written consent of the Contractor; or (2) pursuant to a duly authorized and executed contract between the Navajo Nation and any other tribal, county, state or federal agency; or (3) pursuant to any applicable law requiring disclosure.

**23.2 Right of reuse.** The Contractor acknowledges and agrees that the Navajo Nation may use said property, or any portion thereof, in connection with the Project that is the subject of this Contract, for purposes of completion, modification, restoration, or renovation of such Project, at the sole discretion of the Navajo Nation. Contractor agrees that such reuse shall be without any consideration, compensation or consent of Contractor, and Contractor expressly waives any claims with respect to such reuse. With regard to reuse of said property for any purpose not reasonably related to the Project, said property shall be considered Instruments of Service as provided for in the Primary Contract, and shall be subject to the restrictions on reuse as provided for therein.

#### **24.0 WARRANTY.**

**24.1 Materials and Labor.** Contractor warrants to the Owner that all labor, materials, equipment and furnishings used in, or incorporated into, the Project will be of good quality, new, that the Work will be free from defects in design, materials and workmanship, and that all Work will conform with the requirements of the Construction Documents. If required by the Owner's Representative, the Contractor shall furnish satisfactory evidence of compliance with this warranty. The type, quality and quantum of such evidence, and whether such evidence is satisfactory, shall be within the sole discretion of the Owner's Representative. Any portion of the Work not conforming to these requirements, including substitutions not properly approved and authorized by the Owner, and including non-conformance relating to any materials, equipment, furnishings, labor, installation, or workmanship, may be considered defective.

**24.2 Repair or replacement.** Contractor agrees to repair, replace, or re-perform, or pay the Owner the reasonable cost of such repair, replacement, or re-performance, any portion of the Work that the Owner deems in its sole discretion to be defective, so long as Owner submits to the Contractor a written notice of any defect within 1 calendar year following the issuance of a Certificate of Occupancy for the Project. The choice among repair, replacement, re-performance, or payment shall be the Contractor's. Any steps taken by the Contractor to correct defects shall not act to extend the term of this warranty. All repairs, replacement, or re-performance by the Contractor shall be at no charge to the Owner and shall be performed within 60 calendar days of the Contractor's receipt of notification of the defect, which period shall be extended for delays outside the Contractor's control.

**24.3 Maintenance.** Failure of the Owner to perform reasonable regular maintenance and proper care of the finished Project shall void this warranty.

**24.4 Access to the Project.** Owner must provide access to the Contractor during its normal business hours, Monday through Friday, 8 a.m. to 5 p.m., to inspect the defect reported and, if necessary, to take corrective action.

**24.5 No liens.** Contractor guarantees that, as of the conclusion of this Contract, all work will be free of liens, claims and security interests of any third parties.

**25.0 NO THIRD PARTY BENEFICIARIES.** Notwithstanding any provision of Navajo Nation law, codified or uncoded, or any Navajo Nation common or fundamental law, no provision of this Contract shall be construed

as conferring any rights to, and may not be invoked by or for the benefit of, any other person or entity that is not one of the signatory Parties hereto.

**26.0 ASSIGNMENT RESTRICTED.** The Contractor shall not in any manner whatsoever assign, convey, transfer, or sublet any rights to this Contract or any interest therein including any amendments or modifications thereto, any work product resulting from the work performed or services provided under this Contract including any amendments or modifications thereto, or any monetary claims against the Navajo Nation relating to this Contract or any amendments or modifications thereto, without the prior written consent of the Navajo Nation. Any attempted assignment without such prior consent shall be void; said consent may be granted, granted upon conditions, or withheld, at the Navajo Nation's sole discretion.

**27.0 PARTNERS, SUCCESSORS, SUBCONTRACTORS.** All provisions, conditions and covenants contained in the Contract Documents shall extend to and be binding upon each of the Contractor's owners, partners, team members, successors, heirs, assigns, executors, administrators, employees, officials and agents, including all of the Contractor's subcontractors, and the Contractor expressly agrees that the term "Contractor" whenever used herein, or in any other Contract document, shall be deemed to include all such owners, partners, team members, successors, heirs, assigns, executors, administrators, employees, designees, consultants, officials, agents, and subcontractors.

**28.0 RIGHT TO ASSURANCE.** If at any time prior to the completion of services, the Navajo Nation has reason to believe that the Contractor does not intend to or is unable to complete the contracted services, the Navajo Nation may demand in writing that the Contractor submit written assurance of intent to complete performance. Failure to provide such assurance within fourteen (14) calendar days shall be deemed as a response that the Contractor will not complete services which will allow the Navajo Nation to terminate this Contract.

**29.0 RIGHT TO SUSPEND OR TERMINATE.**

**29.1 Generally.** The rights of the Parties to suspend or terminate this Contract shall be as provided for Section 80-09 of the General Provisions. In addition, upon prior written notice to the Contractor of not less than thirty (30) calendar days, the Navajo Nation may unilaterally order a temporary stoppage of work. If the Contractor is not at fault for stoppage, any additional payment to the Contractor for such stoppage shall be in accordance with Article 32 herein.

**29.2 Non-compliance or violation of laws.** In addition to the Navajo Nation's right of suspension and termination provided for in the Primary Contract, the Navajo Nation may terminate this Contract for Breach if the Nation's Representative determines in writing that the Contractor or any of its' subcontractors has violated any applicable law or regulation in the procurement or performance of this Contract.

**29.3 Falsification, lack of documentation.** The Navajo Nation may terminate this Contract for breach if:

- (a) any statement or documentation regarding any licensing, business registration, insurance coverage, or debts owed, is determined to be false; or
- (b) Contractor has failed to submit in a timely manner any requested documentation pertaining to any licensing, business registration, insurance coverage, or debts owed, and the Nation's Representative determines that the Navajo Nation is unable to issue a Notice to Proceed, or to otherwise proceed with the Project, in a timely manner.

**29.4 Financial responsibility, solvency.** The Navajo Nation may terminate this Contract for breach if:

- (a) the Contractor becomes insolvent or its insolvency is imminent, or the Contractor files for bankruptcy under any chapter of federal law; or

(b) the provider of the Contractor's insurance is not solvent or its insolvency is imminent; or

(c) the Nation receives notice that the Contractor has failed to pay its subcontractors, employees, suppliers or other ancillary firm(s) for any work on this Project.

**29.5 Debarment, suspension.** The Navajo Nation may terminate this Contract if the Navajo Nation or any of its political subdivisions, enterprises, or other related entities, or if any federal or state governmental entity, has for any reason debarred or suspended the Contractor or any of its subcontractors. Such debarment or suspension shall be considered effective notwithstanding any appeal, and shall be effective unless and until conclusively resolved in favor of the Contractor or subcontractor.

**29.6 Termination for Convenience.** Pursuant to 12 N.N.C. §344 and §350, the Navajo Nation shall have the right to terminate this Contract for the convenience of the Navajo Nation.

**30.0 SEVERABILITY.** If any provision of this Contract is determined, by a court of competent jurisdiction arbitration decision, to be invalid, illegal or incapable of being enforced under any rule of law, all other conditions and provisions of this Contract shall nevertheless remain in full force and effect.

**31.0 INDEMNIFICATION.** Contractor agrees to hold harmless and indemnify the Navajo Nation and its divisions, departments, offices, agencies, boards, commissions, committees, enterprises, employees, officers, officials, and agents against any and all losses, costs, damages, claims, expenses, attorney's fees, or other liabilities whatsoever, for any injury, illness, disease or death to persons and for any damage to Nation property arising from the negligent acts or omissions by the Contractor, as defined in Article 27.0 herein, regardless of whether or not any liability is caused in part by an indemnified party.

**32.0 AMENDMENTS; CHANGE ORDERS, MODIFICATIONS.**

**32.1 Written modification required.** Any revisions, amendments, addendums, alterations, change orders, modifications, increases in payment over and above the Original Contract Amount, or changes whatsoever to any provision of the Contract shall be made only by a duly approved written agreement, deemed a modification signed by the signatories of the Contract or their authorized designee.

**32.2 Prior approval required.** The Navajo Nation's authorized representative shall determine that the modification is reasonably related to the scope of work for the project; all modifications must be approved in writing by the Nation's Representative prior to consideration and execution by the Navajo Nation signatory.

**33.0 GOVERNING LAW; COMPLIANCE WITH NAVAJO NATION LAWS.**

**33.1 Navajo Nation Law Governs.** Navajo Nation law governs the interpretation of the Contract Documents.

**33.2 Other laws.** The Contractor shall comply with all other Navajo Nation laws and regulations and of the United States, now in force and effect or as hereafter may come into force and effect that pertain to the work to be performed or services to be provided under this Contract.

**34.0 NAVAJO NATION JURISDICTION.** By voluntarily entering into and executing this Contract, the Contractor expressly consents to the full territorial, administrative, legislative, executive and judicial jurisdiction of the Navajo Nation, including but not limited to, the jurisdiction to regulate, adjudicate disputes, and to levy fines or enter judgments for injunctive relief and/or compensatory and punitive damages, in connection with all activities conducted by the Contractor within the Navajo Nation or which have a proximate (legal) effect on

persons or property within the Navajo Nation. The Contractor hereby acknowledges and agrees that this Contract constitutes a voluntary consensual relationship between the Contractor and the government of the Navajo Nation.

35.0 **SOVEREIGN IMMUNITY.** Nothing herein shall be considered a waiver, express or implied, of the sovereign immunity of the Navajo Nation, except to the limited extent provided for in the Navajo Sovereign Immunity Act, as amended, at 1 N.N.C. §§551 *et seq.*

36.0 **DISPUTE RESOLUTION.** Any claim, dispute, or other matter in question arising out of or relating to this Contract shall be resolved by the negotiation and arbitration procedures set forth as follows:

36.1 **Negotiation.** The Parties shall endeavor to resolve claims or disputes between them by informal good faith negotiation, which negotiation period shall not exceed thirty (30) calendar days, commencing as of the receipt by either Party of the other Party's written "Notice to Invoke Dispute Resolution Procedures."

36.2 **Arbitration.** If the negotiation provided for in Article 36.1 herein does not result in resolution of the Parties' dispute within thirty (30) calendar days of commencement of negotiation, then, unless the Parties agree in writing to extend the time for negotiation, either Party may invoke arbitration by sending Notice of Intent to Commence Arbitration. Any Arbitration invoked against the Navajo Nation shall be in accordance with the procedures referenced in the Navajo Sovereign Immunity Act, as amended, at 1 N.N.C. §554(J) and §554(K), and as set forth in the Navajo Nation Arbitration Act, as amended, at 7 N.N.C. §1101 *et seq.* Any procedure not expressly provided for under Navajo law may be conducted in accordance with the Commercial Arbitration Rules of the American Arbitration Association, except to the extent that any rules are modified by the following:

- (a) unless otherwise agreed to in writing by the Parties, all arbitration procedures shall be held in Shiprock, New Mexico; and
- (b) the arbitration shall be conducted by a single arbitrator selected by the Navajo Nation, unless one of the Parties' claims exceeds \$1,000,000.00, exclusive of interest, costs, and fees; in such case the arbitration shall be conducted by a panel consisting of three (3) arbitrators, one of which shall be chosen by each Party, with the two arbitrators choosing the third; at least one arbitrator shall possess at least ten (10) years of experience in Indian Law; and
- (c) if the Contractor seeks to enforce an arbitration award against the Navajo Nation, a notice of intent to invoke arbitration shall be filed in strict compliance with the notice requirements of the Navajo Sovereign Immunity Act, at 1 N.N.C. § 555; and
- (d) whether as a result of an arbitration provided for herein or of any judicial action to enforce an arbitration award resulting from such arbitration, any award against the Navajo Nation shall be in strict conformance with the provisions of 1 N.N.C. §554(K) 1-6; and
- (e) whether in the context of an arbitration provided for herein or any judicial action to enforce an arbitration award resulting from arbitration, Navajo Nation laws and regulations shall exclusively govern the interpretation of this Contract, the arbitration provisions herein, the arbitration procedures conducted pursuant thereto, and the application of all provisions of the Contract to the Contractor; and
- (f) pursuant to 1 N.N.C. § 554(K) and 7 N.N.C. §1102, the appropriate Navajo Nation district court shall have **exclusive jurisdiction** to compel the Navajo Nation's participation in an arbitration, and shall have exclusive jurisdiction to enforce, modify, or vacate an arbitration award resulting from such arbitration; Contractor understands and agrees that domestication of an arbitration judgment against the Navajo Nation in any other court will violate the Navajo Nation Sovereign

Immunity Act such that the Navajo Nation will be able to assert the defense of sovereign immunity in any other foreign (federal, state, tribal) court; and

(g) neither Party can be awarded any attorney's fees and costs.

**36.3 Exclusive Remedy.** The negotiation and arbitration provisions provided herein shall constitute the sole and exclusive remedy to any dispute or controversy arising from this Contract. This dispute resolution agreement shall be a complete defense to any suit, claim, action or proceeding in any federal, state, or tribal judicial or administrative tribunal; and

**36.4 Post-termination; post-expiration.** Regarding any dispute arising from this Contract, the dispute resolution procedures set forth herein shall survive the termination or expiration of this Contract.

**36.5 Challenges limited.** By entering into this Contract, the Contractor expressly covenants and agrees that it shall not contest or challenge the territorial, administrative, legislative, executive or judicial jurisdiction of the Navajo Nation on the basis that such jurisdiction is inconsistent with the status of the Navajo Nation as an Indian tribal Nation, or that the Navajo Nation government is not a government of general jurisdiction, or that the Navajo Nation government does not possess full police power (i.e., the power to legislate and regulate for the public's general health and welfare) over all lands, persons, activities, transactions, or occurrences within its territorial boundaries, or on any other basis not generally applicable in a similar challenge to the jurisdiction of a state government.

**37.0 DEPARTMENT OF JUSTICE APPROVAL.** Pursuant to 1 N.N.C. §554(J)(2) and (K)(2), Navajo Nation Department of Justice approval is required for all agreements that include a limited waiver of sovereign immunity to compel or enforce arbitration under the Navajo Nation Arbitration Act, as amended, 7 N.N.C. §1101 et seq.

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*Navajo Nation Department of Justice*

\*\*\*\*\* **END OF DOCUMENT** \*\*\*\*\*

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**NAVAJO NATION CERTIFICATION  
Regarding Debarment and Suspension**

Applicant acknowledges that to be the best of his/her knowledge that their company and principal participants on this contract:

1. Are not debarred, suspended, or otherwise slated for debarment, ineligible and/or excluded from participation on Federal, State, and Tribal Government contracts etc.
2. Are not presently nor have been under criminal indictment or civilly charged by a governmental entity (Federal, State and Tribal Government) for fraud, forgery, falsification, theft, bribery, destruction of records, receiving stolen property and other criminal offenses in the administration of a government contract.
3. Have not been terminated for cause or convenience by a governmental entity in the administration of a government contract (Federal, State, and Tribal Government).
4. If the Navajo Nation determines that the Certificate provided herein is not true, it will be grounds to terminate the contract and pursue other legal remedies.

Applicant's Address

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Name & Signature of Applicant

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Type of Print Name

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Signature / Date

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## **STATE AND FEDERAL CLAUSES**

### **CLAUSE 1 ACCESS TO RECORDS AND REPORTS**

1.1 Pursuant to 2 C.F.R. § 200.336 & 2 C.F.R. § 200.333, as well as any related Appendixes thereto, Contractor shall maintain an acceptable cost accounting system. The Contractor agrees to provide the sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives, access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

### **CLAUSE 2 BUY AMERICAN PREFERENCE**

2.1 Contractor agrees to comply with 49 U.S.C. § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP-funded projects are produced in the United States, unless the FAA has issued a waiver for the product; the product is listed as an Excepted CLAUSE, Material or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list. Contractor hereby agrees and warrants that it submitted all of the appropriate Buy America certification with its Proposal, offer, and/or bid.

### **CLAUSE 3 CIVIL RIGHTS**

3.1 Contractor agrees that it will comply with all pertinent statutes, Executive Orders, and all rules or regulations that are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

3.2 This provision binds the contractor and sub tier contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

### **CLAUSE 4 CIVIL RIGHTS – TITLE VI ASSURANCES**

#### **Compliance with Nondiscrimination Requirements**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees as follows:

4.1 **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

**4.2 Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

**4.3 Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.

**4.4 Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

**4.5 Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

- a. Withholding payments to the contractor under the contract until the contractor complies; and/or
- b. Cancelling, terminating, or suspending a contract, in whole or in part.

**4.6 Incorporation of Provisions:** The contractor will include the provisions of paragraphs 4.1 through 4.6 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

#### **Title VI List of Pertinent Nondiscrimination Acts and Authorities**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);

- 49 CFR part 21 (Non-discrimination in Federally-Assisted Programs of the Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

## **CLAUSE 5 DISADVANTAGED BUSINESS ENTERPRISE**

**5.1 Contract Assurance (§ 26.13)** - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

**5.2 Prompt Payment (§26.29)** - The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than thirty (30) days from the receipt of each payment the prime contractor receives from the Navajo Nation. The prime contractor agrees further to return retainage payments to each subcontractor within thirty (30) days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Navajo Nation. This clause applies to both DBE and non-DBE subcontractors.

## **CLAUSE 6 ENERGY CONSERVATION REQUIREMENTS**

**6.1** Contractor and Subcontractor agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201 et seq).

## **CLAUSE 7 FEDERAL FAIR LABOR STANDARDS ACT**

**7.1** This Agreement incorporates the provisions of 29 U.S.C. § 201, *et seq.*, by reference, and those provisions have the same force and effect as if fully set forth herein. Contractor has the responsibility to monitor compliance with these provisions, and Contractor must address any claims or disputes that pertain to a referenced requirement directly with the Federal Agency with enforcement responsibilities, which is the U.S. Department of Labor, Wage and Hour Division, for the provisions of the Federal Fair Labor Standards Act, 29 U.S.C. § 201, *et seq.*

## **CLAUSE 8 OCCUPATIONAL SAFETY & HEALTH ACT OF 1970**

**8.1** All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

## **CLAUSE 9 RIGHT TO INVENTIONS**

**9.1** Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 CFR part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within in the 37 CFR §401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental or research work.

## **CLAUSE 10 TRADE RESTRICTION CERTIFICATION**

**10.1** By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

- a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (U.S.T.R.);
- b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the U.S.T.R; and
- c. has not entered into any subcontract for any product to be used on the Federal on the project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the U.S.T.R.

**10.2** This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

**10.3** The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

**10.4** Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

- (1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the U.S.T.R. or
- (2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such U.S.T.R. list or
- (3) who incorporates in the public works project any product of a foreign country on such U.S.T.R. list;

**10.5** Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

**10.6** The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by U.S.T.R., unless the Offeror has knowledge that the certification is erroneous.

**10.7** This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

## **CLAUSE 11 VETERAN'S PREFERENCE**

**11.1** In the employment of labor (excluding executive, administrative, and supervisory positions), the contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 U.S.C. 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

## **CLAUSE 12 SEISMIC SAFETY**

**12.1** The contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

## **CLAUSE 13 COPELAND "ANTI-KICKBACK" ACT**

**13.1** Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 U.S.C. 874 and 40 U.S.C. 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

## CLAUSE 14 DAVIS-BACON REQUIREMENTS

### 14.1 Minimum Wages

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)

(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative,

will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

#### **14.2. Withholding.**

The Federal Aviation Administration or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

#### **14.3. Payrolls and basic records.**

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name,

address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)

(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i) and that such information is correct and complete;

(2) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying or transcription by authorized representatives of the sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### **14.4. Apprentices and Trainees.**

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level

of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

#### **14.5. Compliance with Copeland Act Requirements.**

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

#### **14.6. Subcontracts.**

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the

compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

**14.7. Contract Termination: Debarment.**

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

**14.8. Compliance with Davis-Bacon and Related Act Requirements.**

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

**14.9. Disputes Concerning Labor Standards.**

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

**14.10. Certification of Eligibility.**

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

**CLAUSE 15  
DISTRACTED DRIVING**

**15.1 TEXTING WHEN DRIVING** - In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving" (10/1/2009) and DOT Order 3902.10 "Text Messaging While Driving" (12/30/2009), the FAA encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or sub-grant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding \$3,500 and involve driving a motor vehicle in performance of work activities associated with the project.

**CLAUSE 16**  
**AFFIRMATIVE ACTION REQUIREMENTS**

**16.1** Pursuant to 41 C.F.R. Part 60-4 and Executive Order 11246, the following "Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)" is hereby provided as follows:

**16.1.1.** The Offeror's or Bidder's (Contractor's) attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

**16.1.2.** The goals and timetables for minority and female participation, expressed in percentage terms for Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for Minority Participation in Each Trade	Goals for Female Participation in Each Trade
	45.9% Vol. 45, Federal Register, Page 65984, 10/3/80	6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally-assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor is also subject to the goals for both federally funded and non-federally funded construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training shall be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to Contractor or from project to project, for the sole purpose of meeting the contractor's goals, shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

**16.1.3.** The Contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs (OFCCP), within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of subcontract; and the geographical area in which the subcontract is to be performed.

**16.1.4.** As used in this notice and in the contract resulting from this solicitation, the "covered area" is Shiprock, New Mexico.

**CLAUSE 17**  
**EQUAL OPPORTUNITY CLAUSE AND SPECIFICATIONS**

**17.1** During the performance of this Agreement, Contractor agrees as follows:

**17.1.1** Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

**17.1.2** Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

**17.1.3** Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

**17.1.4** Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

**17.1.5** Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

**17.1.6** In the event of Contractor's noncompliance with the nondiscrimination clauses of this Agreement or with any of the said rules, regulations, or orders, this Agreement may be canceled, terminated, or suspended in whole or in part and Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

**17.1.7** Contractor will include the portion of the sentence immediately preceding Paragraph 17.1 and the provisions of Paragraphs 17.1.1 through this Paragraph 17.1.7 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however*, that in the event Contractor becomes involved in, or

is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, Contractor may request the United States to enter into such litigation to protect the interests of the United States.

**17.2 Standard Federal Equal Employment Opportunity Construction Contract Specifications:**

a. As used in these specifications:

- A. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
  - B. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;
  - C. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;
  - D. "Minority" includes:
    - i. Black (all) persons having origins in any of the Black African racial groups not of Hispanic origin);
    - b. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
    - c. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - d. American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees.

The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.
6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:
  - A. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
  - B. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

- C. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.
- D. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.
- E. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.
- F. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- G. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- H. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.
- I. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any

recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

- J. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.
  - K. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
  - L. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
  - M. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.
  - N. Ensure that all facilities and company activities are nonsegregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
  - O. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
  - P. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both

minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 23.7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

## **CLAUSE 18**

### **PROHIBITION OF SEGREGATED FACILITIES**

**18.1** The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

**18.2** "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

**18.3** The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

## **CLAUSE 19 PROCUREMENT OF RECOVERED MATERIALS**

**19.1** Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use of products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

- a) The contract requires procurement of \$10,000 or more of a designated item during the fiscal year; or,
- b) The contractor has procured \$10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at  
[www.epa.gov/epawaste/conserve/tools/cpg/products/](http://www.epa.gov/epawaste/conserve/tools/cpg/products/)

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

- a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
- b) Fails to meet reasonable contract performance requirements; or
- c) Is only available at an unreasonable price.

## **CLAUSE 20 TERMINATION OF AGREEMENT**

### **Termination for Convenience (Construction & Equipment Contracts)**

**20.1** The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1. Contractor must immediately discontinue work as specified in the written notice.

2. Terminate all subcontracts to the extent they relate to the work terminated under the notice..
3. Discontinue orders for materials and services except as directed by the written notice.
4. Deliver to the owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work and as directed in the written notice.
5. Complete performance of the work not terminated by the notice.
6. Take action as directed by the owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

- a) completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
- b) documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
- c) reasonable and substantiated claims, costs and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
- d) reasonable and substantiated expenses to the contractor directly attributable to Owner's termination action

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

### **Termination for Default (Construction)**

**20.2** Section 80-09 of FAA Advisory Circular 150/5370-10 establishes conditions, rights and remedies associated with Owner termination of this contract due default of the Contractor.

## **CLAUSE 21 DEBARMENT AND SUSPENSION**

**21.1** Contractor certifies that neither it nor its principals are presently debarred or suspended by any federal department or agency from participation in this Agreement and transaction.

**21.2** Contractor will administer each lower tier subcontract that exceeds \$25,000 as a "covered transaction" and will verify that each lower tier participant is not debarred or otherwise disqualified from participation in the Project or in the performance of this Agreement by checking the System for Award Management at <http://www.sam.gov>, by collecting a certification statement similar to

the statement contained in Paragraph 27.1, and inserting a clause or condition in the covered transaction with the lower tier contract. If the FAA later determines that a lower tier participant failed to tell a higher tier that it was excluded or disqualified at the time it entered into the covered transaction, the FAA may pursue any available remedy, including suspension and debarment.

## **CLAUSE 22**

### **CONTRACT WORKHOURS & SAFETY STANDARDS ACT REQUIREMENTS**

#### **22.1 Overtime Requirements.**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

#### **22.2 Violation; Liability for Unpaid Wages; Liquidated Damages.**

In the event of any violation of the clause set forth in paragraph 22.1 of this clause, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 22.1 of this clause.

#### **22.3 Withholding for Unpaid Wages and Liquidated Damages.**

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 22.2 of this clause.

**22.4** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 22.1 through 22.4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 22.1 through 28.4 of this clause.

## **CLAUSE 23**

### **LOBBYING AND INFLUENCING FEDERAL EMPLOYEES**

**23.1** The bidder or offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief that:

**23.1.1** No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or

employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of an Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

**23.1.2** If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an office or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instruction.

**23.1.3** The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontract, sub-grants, and contracts under grant, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

**23.2** This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject of a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

## **CLAUSE 24 BREACH OF CONTRACT**

**24.1** Contractor agrees to comply with 2 CFR § 200 Appendix II(A) Any violation or breach of terms of this contract on the part of the contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

**24.2** Owner will provide *Contractor* written notice that describes the nature of the breach and corrective actions the *Contractor* must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the *Contractor* must correct the breach. Owner may proceed with termination of the contract if the *Contractor* fails to correct the breach by deadline indicated in the Owner's notice.

**24.3** The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

## **CLAUSE 25 CLEAN AIR & WATER POLLUTION CONTROL**

**25.1** Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 U.S.C. § 740-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. § 1251-1387). The Contractor agrees to report any violation to the

Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceeds \$150,000.

## **CLAUSE 23 BONDING CLAUSES**

**26.1** Contractor agrees to furnish a performance bond for 100 percent of the Contract Price. This bond is to be executed in connection with this Agreement in order to secure fulfillment of all of Contractor's obligations under this Agreement.

**26.2** Contractor agrees to furnish a payment bond for 100 percent of the Contract Price. This bond is to be executed in connection with this Agreement to ensure payment of all monies owed by Contractor under this Agreement and other Contract Documents.

## **CLAUSE 27 CHANGE ORDERS**

**27.1** Changes in the scope of work for the Project or the performance of the work under this Agreement and any materials used may be accomplished after execution of the Agreement and without invalidating the Agreement. However, a change order shall be in writing and signed by Sponsor, Contractor, and Engineer. Sponsor agrees to promptly review and approve or disapprove change orders so as to not delay the Project. Change orders shall include notice to the Sponsor of the approximate increase in cost as a result thereof. Any revision to the Plans and Specifications that are approved by Owner or Engineer, if any, shall be considered to be a change order that has been approved by Owner when delivered to Contractor, requiring no further approval by Owner.

## **CLAUSE 28 SPONSOR CERTIFICATIONS**

**28.1** Sponsor hereby certifies and agrees that it has completed and prepared the following Certifications and Disclosures: a) the Certification and Disclosure Regarding Potential Conflicts of Interest Airport Improvement Program Sponsor Certification; b) the Equipment and Construction Contracts Airport Improvement Sponsor Certification; c) the Project Plans and Specifications Airport Improvement Program Sponsor Certification; d) the Selection of Consultants Airport Improvement Program Sponsor Certification; e) Construction Project Final Acceptance Airport Improvement Program Sponsor Certification; f) the Drug-Free Workplace Airport Improvement Program Sponsor Certification; and g) Real Property Acquisition Airport Improvement Program Sponsor Certification. These Certifications and Disclosures are being attached to this Agreement and are to be considered fully incorporated in this Agreement by their reference herein.

## **CLAUSE 29 DEBRIS REMOVAL**

**29.1** Contractor shall, at all times, keep the work site reasonably free from the accumulation of waste materials or rubbish caused by its operations during its work on the Project. All waste and debris, tools or equipment, and surplus materials or machinery shall be removed as a condition of the substantial completion of the Project.

**CLAUSE 30  
REQUIRED ACTIONS**

**30.1** Contractor and Sponsor each agree that they will, at any time, take all actions and sign and deliver all documents reasonably required to fully perform this Agreement in accordance with its intent and provisions.

**CLAUSE 31  
MODIFICATION OF AGREEMENT**

**33.1** No subsequent modification of the terms of this Agreement shall be valid, binding on the parties, or enforceable unless made in writing and signed by the parties.

**CLAUSE 32  
SEVERABILITY**

**34.1** In the event any part of this Agreement is found to be void, illegal, invalid, or unenforceable under any present or future law, then the remaining provisions of this Agreement shall nevertheless be binding with the same effect as though such part was deleted.

**CLAUSE 33  
FACSIMILE OR ELECTRONIC SIGNATURES**

**35.1** Facsimile or electronic transmission of a signature shall be sufficient to evidence the execution of this Agreement.

**CLAUSE 34  
CAPTIONS**

**36.1** The captions in this Agreement are inserted only for the purpose of convenient reference and in no way define, limit, or prescribe the scope or intent of this Agreement or any part thereof.

**CLAUSE 35  
BINDING EFFECT**

**37.1** This Agreement shall be binding upon and insure to the benefit of the parties hereto and their respective heirs, successors, and assigns.

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## CONSTRUCTION PERFORMANCE & MAINTENANCE BOND

**Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.**

CONTRACTOR (Name and Address):

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SURETY (Name and Principal Place of Business)

OWNER (Name and Address):

Navajo Nation  
P.O. Box 4620  
Window Rock, Arizona 86515

### CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

Shiprock Airstrip  
Shiprock, New Mexico  
AIP No. 3-35-0049-005-2017  
NMDOT No. 5V5-17-04

### BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

CONTRACTOR AS PRINCIPAL

Company:  
(Corp. Seal)

SURETY

Company:  
(Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:

Signature: \_\_\_\_\_  
Name and Title:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, including all related Construction Documents and modifications thereto, which is incorporated herein by reference.
2. If the Contractor completes the Contract and corrects all defects that appear within one year after final acceptance of all the work required under the Contract Documents, the Surety and the Contractor shall have no obligation under this bond, except to participate in conferences as provided in Subparagraph 3.1.
3. The Surety's obligations under this Bond shall arise after:
  - 3.1 The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract, or for correcting defects in workmanship or material that have appeared within one year after final acceptance of the work. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Contract, or to correct said defects in workmanship or material, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and
  - 3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the Contract or to correct said defects. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and
  - 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Contract or to a contractor selected to perform the Contract, or to correct said defects in accordance with the terms of the Contract with the Owner.
4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
  - 4.1 Arrange for the Contractor, with consent of the Owner to perform and complete the Contract, or to correct said defects in workmanship or material; or
  - 4.2 Undertake to perform and complete the Contract, or to correct said defects in workmanship or material itself, through its agents or through independent contractors; or
  - 4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract to (a) perform and complete the Contract or correct said defects in workmanship or materials; (b) arrange for a Contract to be prepared for execution by the Owner and the Contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract and (c) pay to the Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or
  - 4.4 Waive its right to perform and complete, arrange for completion or obtain a new contractor and with reasonable promptness under the circumstances:
    1. After investigation, determine the amount for which it may be liable to the Owner and as soon as practicable after the amount is determined, tender payment therefore to the Owner; or
    2. Deny liability in whole or in part and notify the Owner citing reasons therefore.
5. If the Surety does not proceed as provided in Paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond and the Owner shall be entitled to enforce any remedy available to the Owner if the Surety proceeds as provided in Subparagraph 4.4 and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
6. After the Owner has terminated the Contractor's right to complete the Contract, or to correct said defects in workmanship or materials and if the Surety elects to act under Subparagraphs 4.1, 4.2 or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Contract and related Construction Documents and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Contract and Construction Documents. To the limit of the amount of this Bond, but subject to commitment by the Owner to pay the Balance of the Contract Price to mitigation of costs and damages of the Contract, the Surety is obligated without duplication for:
  - 6.1 The responsibilities of the Contractor for completion of the Contract and correction of any defects that appear within one year following final acceptance of all the work required under the Construction Contract and related Documents;
  - 6.2 Additional legal, design professional and delay costs resulting from the Contractor's Default, or resulting from the actions or failure to act of the Surety under Paragraph 4; and
  - 6.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or nonperformance of the Contractor.
7. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Contract and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this bond to any person or entity other than the Owner or its heirs, executors, administrators, or successors.
8. The Surety hereby waives notice of any change, including changes of time and changes in the work required under the Contract or related subcontracts, purchase orders and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after Owner became aware, or reasonably should have become aware of Contractor Default or within two years after the Surety refuses or fails to perform its obligations under this Bond; whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period for limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.
11. When this bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted hereon and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
12. Definitions:
  - 12.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Contract after all proper adjustments have been made, including allowance to the Contractor of any amount received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Contract.
  - 12.2 Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
  - 12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
  - 12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

## CONSTRUCTION PAYMENT BOND

**Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.**

CONTRACTOR (Name and Address):

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SURETY (Name and Principal Place of Business)

OWNER (Name and Address):

Navajo Nation  
P.O. Box 4620  
Window Rock, Arizona 86515

### CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

SHIPROCK AIRSTRIP  
Shiprock, New Mexico  
AIP No. 3-35-0049-005-2017  
NMDOT No. 5V5-17-04

### BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

CONTRACTOR AS PRINCIPAL

Company:  
(Corp. Seal)

SURETY

Company:  
(Corp. Seal)

Signature: \_\_\_\_\_  
Name and Title:

Signature: \_\_\_\_\_  
Name and Title:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference.
2. With respect to the Owner, this obligation shall be null and void if the Contractor:
  - 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants and
  - 2.2. Defends, indemnifies and holds harmless the Owner from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address as described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety and provided there is no Owner Default.
3. With respect to Claimant's this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
4. The Surety shall have no obligation to Claimants under this Bond until:
  - 4.1. Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
  - 4.2. Claimants who do not have a direct contract with the Contractor:
    1. Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and
    2. Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and
    3. Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.
5. If a notice required by Paragraph 4 is given by the Owner to the Contractor or to the Surety, that is sufficient compliance.
6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
  - 6.1. Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
  - 6.2. Pay or arrange for payment any undisputed amounts.
7. The Surety's total obligation shall not exceed the amount of this Bond and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
8. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2 (3), or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the Contractor, however accomplished, shall be accomplished shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory bond and not as a common law bond.
14. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. DEFINITIONS
  - 15.1. Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.
  - 15.2. Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes hereto.
  - 15.3. Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

**CERTIFICATION OF INCLUSION OF LABOR  
& EEO REQUIREMENTS IN SUBCONTRACTS**

**AIP No.:** 3-35-0049-005-2017  
**NMDOT No.:** 5V5-17-04

**Airport:** Shiprock Airstrip

The Prime Contractor whose signature appears below certifies that a Subcontract was awarded on \_\_\_\_\_ to \_\_\_\_\_ to perform the following Work: \_\_\_\_\_

In the amount of \$ \_\_\_\_\_

All of the required clauses and certifications are incorporated into the Subcontract for this Work.

BY: \_\_\_\_\_  
(Signature)

\_\_\_\_\_, 2017 \_\_\_\_\_  
(Name and Title)

**Applicable to subcontracts over \$2,000 and as noted:**

The Subcontractor whose signature appears below certifies that the following provisions of the Prime Contractor of the above AIP project are incorporated into and made a part of its Subcontract:

- |   |   |
|---|---|
| (1) Standard Equal Employment Opportunity Clauses and Specifications (if over \$10,000) | (8) Subcontracts  |
| (2) Davis Bacon Act   | (9) Contract Termination-Debarment  |
| (3) Contract Work Hours and Safety Standards Act - Overtime Requirements                | (10) Working Conditions   |
| (4) Apprentices and Trainees  | (11) Minimum Wages and Wage Rates   |
| (5) Payrolls and Records  | (12) Violations; Liability for Unpaid Wages; Liquidated Damages   |
| (6) Compliance with Copeland Regulations  | (13) Goals and Timetables for Minority and Female Participation (if over \$10,000)  |
| (7) Withholding of Funds for Unpaid Wages and Liquidated Damages                        | (14) Standard Assurance Provision required by 14 CFR Part 152, Subpart E, "Non-discrimination in Airport Aid Program (all contract and subcontracts). |

The Subcontract should also contain Certificate of Nonsegregated Facilities as a part of said Subcontract.

The Subcontractor whose signature appears below also acknowledges his responsibility under the Subcontract for including these clauses in any Lower Tier Subcontract.

\_\_\_\_\_, 2017 By: \_\_\_\_\_  
(Date) (Signature)

SOURCES OF LABOR RECEIVING STANDARD FORM 36 "NOTICE OF NONDISCRIMINATION IN EMPLOYMENT" \_\_\_\_\_  
(Name and Title)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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**NOTICE TO PROCEED**

TO:

DATE:

**Schedule I:** Reconstruct Runway 2/20 and Connector Taxiway A

**Schedule II:** Runway 2/20 Airfield Lighting and Signage (Incandescent)

**Schedule II Alternate:** Runway 2/20 Airfield Lighting and Signage (LED)

**Schedule III:** Holding Bay

AIP No. 3-35-0049-005-2017

NMDOT No. 5V5-17-04

You are notified that the Contract Time under the above Contract will commence to run on \_\_\_\_\_. By that date, you are to start performing your obligations under the Contract Documents and you are to complete the Work within sixty (60) consecutive calendar days thereafter. The date of completion of all Work is therefore \_\_\_\_\_, 2017.

NAVAJO NATION

By \_\_\_\_\_, President  
P.O. Box 4620  
Window Rock, Arizona 86515

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by:

\_\_\_\_\_, Contractor

this the \_\_\_\_\_ day of \_\_\_\_\_, 2017

By \_\_\_\_\_, \_\_\_\_\_  
(Title)

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**CONTRACT CHANGE ORDER NO. \_\_\_\_\_**  
**or**  
**SUPPLEMENTAL AGREEMENT NO. \_\_\_\_\_**

**AIRPORT:** Shiprock Airstrip

**DATE:**

**LOCATION:** Shiprock, New Mexico

**AIP NO.:** 3-35-0049-005-2017

**CONTRACTOR:**

**NMDOT No.:** 5V5-17-04

You are requested to perform the following described Work upon receipt of an approved copy of this document or as directed by the Engineer:

ITEM NO.	DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
This Change Order Total			\$		
Previous Change Order(s) Total			\$		
Original Contract Price			\$		
Revised Contract Total			\$		

The time provided for completion in the Contract is (unchanged) (decreased) (increased) by \_\_\_\_\_ calendar days. This document shall become an Amendment to the Contract and all provisions of the Contract will apply. Changes are shown on the attached Quantities Tabulation.

Recommended by: \_\_\_\_\_  
Engineer

\_\_\_\_\_  
Date

Approved by: \_\_\_\_\_  
Owner

\_\_\_\_\_  
Date

Accepted by: \_\_\_\_\_  
Contractor

\_\_\_\_\_  
Date

Concurred by: \_\_\_\_\_  
Navajo Nation

\_\_\_\_\_  
Date

Approved by: \_\_\_\_\_  
Federal Aviation Administration

\_\_\_\_\_  
Date

**NOTE:** Change Orders and Supplemental Agreements require FAA approval prior to construction. Otherwise, no Federal participation can be granted.

**AIP NO.** 3-35-0049-005-2017

**CHANGE ORDER NO.**

**NMDOT NO.** 5V5-17-04

**AIRPORT:** Shiprock Airstrip

**LOCATION:** Shiprock, New Mexico

**JUSTIFICATION FOR CHANGE**

1. Brief description of the proposed Contract change(s) and location(s).
2. Reason(s) for the change(s). (Continue on reverse if necessary.)
3. Justifications for Unit Prices or Total Cost.
4. The Sponsor's share of this cost is available from:
5. If this is Supplemental Agreement involving more than \$2,000, is the Cost Estimate based on the latest wage rate decision? Yes ☐ No ☐ Not Applicable ☐
6. Has Consent of Surety been obtained? Yes ☐ No ☐ Not Applicable ☐
7. Will this change affect the insurance coverage? Yes ☐ No ☐
8. If yes, will the policies be extended? Yes ☐ No ☐
9. Has this Change Order been discussed with FAA officials?  
Yes ☐ No ☐ When \_\_\_\_\_ With Whom \_\_\_\_\_

Comment \_\_\_\_\_

Submit four executed copies to the FAA.

**APPLICATION FOR PAYMENT NO. \_\_\_\_\_**

To Navajo Nation (OWNER). Contract for Shiprock Airstrip Improvements dated \_\_\_\_\_, OWNER'S AIP No. 3-35-0049-005-2017; NMDOT No. 5V5-17-04. ENGINEER'S Project No. 176437. For Work accomplished through the date of \_\_\_\_\_.

**ATTACH ITEMIZED LIST**

Accompanying Documentation:	GROSS AMOUNT DUE	\$ _____
_____	LESS ____% RETAINAGE	\$ _____
_____	AMOUNT DUE TO DATE	\$ _____
_____	LESS PREVIOUS PAYMENTS	\$ _____
_____	AMOUNT DUE THIS APPLICATION	\$ _____

**CONTRACTOR'S Certification:**

The undersigned CONTRACTOR certifies that (1) all previous Progress Payments received from OWNER on account of Work done under the Contract referred to above have been applied to discharge in full all obligations of CONTRACTOR incurred in connection with Work covered by prior Applications for Payment numbered 1 through \_\_\_\_\_ inclusive; and (2) title to all materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of final acceptance of Project free and clear of all liens, claims, security interests and encumbrances.

Dated \_\_\_\_\_, 2017

\_\_\_\_\_  
CONTRACTOR

By \_\_\_\_\_

**ENGINEER'S Recommendation:**

This Application (with accompanying documentation) meets the requirements of the Contract Documents and payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Dated \_\_\_\_\_, 2017

Armstrong Consultants, Inc.  
ENGINEER

By \_\_\_\_\_

**OWNER'S Approval:**

This Application is approved.

Dated \_\_\_\_\_, 2017

Navajo Nation  
SPONSOR

By \_\_\_\_\_

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General Decision Number: NM170015 02/24/2017 NM15

Superseded General Decision Number: NM20160015

State: New Mexico

Construction Type: Heavy

County: San Juan County in New Mexico.

#### HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017.

The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number    Publication Date

0        01/06/2017

1        01/27/2017

2        02/24/2017

CARP1319-001 06/01/2016

	Rates	Fringes
CARPENTER	\$ 23.75	9.92

-----  
\* ELEC0611-014 01/01/2017

	Rates	Fringes
ELECTRICIAN		
Zone 1	\$ 30.00	10.60

ZONE 1: Mileage calculated from the main post office in the following towns: Albuquerque-40 miles, Belen-12 miles, Carrizozo-12 miles, Clovis-12 miles, Espanola-14 miles, Farmington-6 miles, Gallup-10 miles, Las Vegas-8 miles, Los Lunas-12 miles, Portales-12 miles, Ratan-6 miles, Roswell-12 miles, Ruidoso-12 miles, Santa Fe-10 miles, Tucumcari-6 miles.

ZONE 2: Extending up to 20 miles beyond Zone 1, EXCEPT ALBURQUERQUE, shall receive 9% above Zone 1 rate.

ZONE 3: Extending up to 30 miles beyond Zone 1, EXCEPT ALBURQUERQUE, shall receive 15% above Zone 1 rate.

ZONE 4: Extending more than 30 miles beyond Zone 1, EXCEPT ALBURQUERQUE, shall receive 26% above Zone 1 rate.

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ENGI0953-005 04/01/2016

	Rates	Fringes
Power Equipment Operator		
(2) Forklift	\$ 19.56	6.09
(4) Bulldozer	\$ 19.88	6.09

SHAFT AND TUNNEL WORK - \$.15 per hour above regular rate.

HAZARDOUS PAY - The following pay shall be applicable for every hour an operating engineer is required by governmental regulations and does wear special equipment for hazardous work at the designated levels. This is applicable in all three zones

LEVEL C - 10% above regular hourly wage

LEVEL B - 10% above regular hourly wage

LEVEL A - 15% above regular hourly wage

ZONE PAY The reference point for determining zone pay shall be from the intersection of Interstate Highway 25 and I-40.

Zone 1 - Albuquerque - 0 to 50 mile radius from I-40 shall be a Free Zone - Farmington - 0 to 50 mile radius of Farmington City Hall shall be a Free Zone

Zone 2 - Shall be \$2.50 per hour above base pay. Will apply outside of above parameters up to 35 miles.

Zone 3 - Shall be \$1.50 cents per hour above Zone 2 for a total of \$4.00 per hour and will apply after 35 miles of Zone one's parameters.

-----  
SUNM2009-009 09/14/2010

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	\$ 16.53	1.95
IRONWORKER, REINFORCING	\$ 20.79	7.56
LABORER: Common or General	\$ 12.47	0.35
LABORER: Flagger	\$ 10.65	1.91

LABORER: Landscape	\$ 11.00	0.35
LABORER: Mason Tender - Cement/Concrete	\$ 12.46	0.00
LABORER: Pipelayer	\$ 13.60	0.00
OPERATOR: Backhoe	\$ 18.38	3.73
OPERATOR: Bobcat/Skid Steer/Skid Loader	\$ 13.77	0.00
OPERATOR: Grader/Blade	\$ 18.56	0.00
OPERATOR: Loader (Front End)	\$ 15.79	1.81
OPERATOR: Tractor	\$ 14.74	0.26
PAINTER: Brush, Roller and Spray	\$ 17.30	1.80
TRUCK DRIVER: Dump Truck	\$ 12.45	0.26
TRUCK DRIVER: Pickup Truck	\$ 12.10	1.73
TRUCK DRIVER: Water Truck	\$ 14.74	0.00

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

## Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

## Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

## Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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## WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination

- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

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STATE OF NEW MEXICO  
NEW MEXICO DEPARTMENT OF  
WORKFORCE SOLUTIONS  
Labor Relations Division  
121 Tijeras Ave NE, Suite 3000  
Albuquerque, NM 87102  
[www.dws.state.nm.us](http://www.dws.state.nm.us)

## PUBLIC WORKS PROJECT REQUIREMENTS

As a participant in a Public Works project valued at more than \$60,000 in the State of New Mexico, the following list addresses many of the responsibilities that are defined by statute or regulation to each project stakeholder.

### Contracting Agency

- Ensure that all Contractors wishing to bid on a Public Works project when the project is \$60,000 or more are actively registered with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> (Contractor Registration) prior to bidding.
- Please submit Notice of Award (NOA) and Subcontractor List(s) to the PWAA website promptly after the project is awarded.
- Please update the Subcontractor List(s) on the PWAA website whenever changes occur.

### General Contractor

- Provide a complete Subcontractor List and Statements of Intent (SOI) to Pay Prevailing Wages for each Contractor to the Contracting Agency within 3 (three) days of award.
- Ensure that all Subcontractors wishing to bid on a Public Works project have an active Contractor Registration with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> prior to bidding when their bid will exceed \$60,000.
- Submit bi-weekly certified payrolls to the Contracting Agency.
- Make certain the Public Works Apprentice and Training Act contributions are paid either to an approved Apprenticeship Program or to the Public Works Apprentice and Training Fund.
- Confirm the Wage Rate poster, provided in PWAA, is displayed at the job site in an easily accessible place.
- Make sure, when a project has been completed, the Affidavits of Wages Paid (AWP) are sent to the Contracting Agency.

### Subcontractor

- Ensure that all Subcontractors wishing to bid on a Public Works project have an active Contractor Registration with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> prior to bidding when their bid will exceed \$60,000.
- Submit bi-weekly certified payrolls to the General Contractor(s).



STATE OF NEW MEXICO  
NEW MEXICO DEPARTMENT OF  
WORKFORCE SOLUTIONS  
Labor Relations Division  
121 Tijeras Ave NE, Suite 3000  
Albuquerque, NM 87102  
[www.dws.state.nm.us](http://www.dws.state.nm.us)

- Make certain the Public Works Apprentice and Training Act contributions are paid either to an approved Apprenticeship Program or to the Public Works Apprentice and Training Fund.

## **Additional Information**

Reference material and forms may be found at New Mexico Department of Workforce Solutions Public Works web pages at: [http://www.dws.state.nm.us/new/Labor\\_Relations/publicworks.html](http://www.dws.state.nm.us/new/Labor_Relations/publicworks.html).

## **CONTACT INFORMATION**

Contact the Labor Relations Division for any questions relating to Public Works projects by email at [public.works@state.nm.us](mailto:public.works@state.nm.us) or call (505) 841-4400.



STATE OF NEW MEXICO  
NEW MEXICO DEPARTMENT OF  
WORKFORCE SOLUTIONS  
Labor Relations Division,  
121 Tijeras Ave NE, Suite 3000  
Albuquerque, NM 87102  
[www.dws.state.nm.us](http://www.dws.state.nm.us)

## Wage Decision Approval Summary

1) Project Title: Shiprock Airstrip Runway 2/20 Reconstruction  
Requested Date: 04/10/2017  
Approved Date: 04/11/2017  
Approved Wage Decision Number: SJ-17-0577-A

### Wage Decision Expiration Date for Bids: 08/09/2017

2) Physical Location of Jobsite for Project:  
Job Site Address: #16 Old Coalmine Road  
Job Site City: Mentmore  
Job Site County: San Juan

3) Contracting Agency Name (Department or Bureau): Navajo Nation WMB  
Contracting Agency Contact's Name: Jason John  
Contracting Agency Contact's Phone: (928) 729-4004 Ext.

4) Estimated Contract Award Date: 08/01/2017

5) Estimated total project cost: \$3,500,000.00  
a. Are any federal funds involved?: Yes - \$3,150,000.00  
b. Does this project involve a building?: No  
c. Is this part of a larger plan for construction on or appurtenant to the property that is subject to this project?: No  
d. Are there any other Public Works Wage Decisions related to this project?: No  
e. What is the ultimate purpose or functional use of the construction once it is completed?: Runway pavement section has reached its useful life. The runway needs to be reconstructed for safety purposes. Ultimate goal is to have a usable runway.

6) Classifications of Construction:

Classification Type and Cost Total	Description
Highway/Utilities (A) Cost: \$3,500,000.00	The runway and connector taxiway reconstruction work will include earthwork, drainage, paving, erosion control, and seeding.

# TYPE "A" - STREET, HIGHWAY, UTILITY & LIGHT ENGINEERING

Effective January 1, 2017

Trade Classification	Base Rate	Fringe Rate On and Prior to February 10, 2017	Fringe Rate After February 10, 2017
Bricklayer/Blocklayer/Stonemason	23.46	8.40	8.40
Carpenter/Lather	23.75	9.27	9.27
Cement Mason	17.42	6.35	6.35
Ironworker	26.50	14.32	14.32
Painter (Brush/Roller/Spray)	16.60	5.78	5.78
Plumber/Pipefitter	22.84	7.48	7.48
<b>Electricians (outside)</b>			
Groundman	21.81	10.92	10.92
Equipment Operator	31.31	13.39	13.39
Lineman/Wireman or Tech	36.83	14.82	14.82
Cable Splicer	40.51	15.38	15.38
<b>Laborers</b>			
Group I	12.20	5.30	5.30
Group II	12.50	5.30	5.30
Group III	12.90	5.30	5.30
<b>Operators</b>			
Group I	16.69	6.03	6.33
Group II	17.44	6.03	6.33
Group III	17.55	6.03	6.33
Group IV	17.63	6.03	6.33
Group V	17.75	6.03	6.33
Group VI	17.89	6.03	6.33
Group VII	18.27	6.03	6.33
Group VIII	18.50	6.03	6.33
Group IX	25.45	6.03	6.33
Group X	28.35	6.03	6.33
<b>Truck Drivers</b>			
Group I	16.00	7.02	7.02
Group II	16.00	7.02	7.02
Group III	16.00	7.02	7.02
Group IV	16.00	7.02	7.02

NOTE: SUBSISTENCE, ZONE AND INCENTIVE PAY APPLY ACCORDING TO THE PARTICULAR TRADES COLLECTIVE BARGAINING AGREEMENT. DETAILS ARE LOCATED AT [WWW.DWS.STATE.NM.US](http://WWW.DWS.STATE.NM.US).

# **INSTRUCTIONS FOR COMPLETING AFFIDAVIT OF WAGES PAID**

## **GENERAL CONTRACTOR**

1. Enter general contractor information and provide signature.
2. Enter State Wage Decision Number as listed in bid documents. (Example: BE 13-0123 B)
3. Enter project title - listed in bid documents.
4. Enter project physical address - exact location of project (job site).
5. Enter completion date of project.
6. All Affidavits' must be sent to the Contracting Agency.

## **SUB CONTRACTOR**

1. Enter general contractor information, but general contractor signature is not needed.
2. Enter sub contractor information as indicated and provide signature.
3. Enter sub contractor completion date.

NOTE: A separate signed form is needed for each contractor.

## **2<sup>ND</sup>, 3<sup>RD</sup>, etc TIER SUB CONTRACTOR**

1. Enter sub contractor information, subcontractor signature is not needed.
2. Enter 2nd tier sub contractor information and provide signature.
3. Enter 2nd tier contract completion date.

(Revised 8/23/13)

**AFFIDAVIT OF WAGES PAID**  
**To Be Completed After Construction Is Complete**  
**ALL FIELDS ARE REQUIRED**  
**FORM MUST BE SENT TO THE CONTRACTING AGENCY**

<b>General Contractor Information</b>		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Estimated Completion Date:	<b>State Wage Decision Number:</b>	
Project Title:	Project Physical Address:	
Print Name:	General Contractor Signature:	
		Date you completed work on this project:
<b>Sub Contractor Information</b>		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Sub Contractor Signature:	
		Date you completed work on this project:
<b>2<sup>nd</sup>, 3<sup>rd</sup>, etc. Tier Sub Contractor Information</b>		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Tier Signature:	

I hereby certify that the above information is correct and that all workers I employ on this public works project were paid no less than the Prevailing Wage Rate(s) as determined by the Department of Workforce Solutions, Labor Relations Division for this project as identified by the State Wage Decision Number. I understand that contractors who violate Prevailing Wage Laws (i.e., incorrect job classification, improper payment of prevailing wages, and/or overtime, etc.), are subject to debarment procedures and shall be required to pay any back wages due to workers. (Ref. Labor Relations Division Public Works Minimum Wage Act Policy Manual (11.1.2 NMAC) & Public Works Minimum Wage Act (13-4-11 through 13-4-18, NMSA 78)).

Contractor's Signature                      Date

(Revised 08/23/13)

# **INSTRUCTIONS FOR COMPLETING STATEMENT OF INTENT TO PAY PREVAILING WAGES**

## **GENERAL CONTRACTOR**

1. Enter general contractor information and provide signature.
2. Enter State Wage Decision Number as listed in bid documents. (Example: BE-13-0123 B)
3. Enter project title - listed in bid documents.
4. Enter project physical address - exact location of project (job site).
5. Enter estimated start & completion dates of project.
6. Enter general contractor's contract amount.
7. All Statements must be sent to the Contracting Agency.

## **SUB CONTRACTOR**

1. Enter general contractor information, but general contractor signature is not needed.
2. Enter sub contractor information as indicated and provide signature.
3. Enter sub contractor contract amount.

NOTE: A separate signed form is needed for each contractor.

## **2ND TIER SUB CONTRACTOR**

1. Enter general contractor information, but general contractor signature is not needed.
2. Enter sub contractor information; subcontractor signature not needed.
3. Enter 2nd tier sub information and provide signature.
4. Enter 2nd tier contractors contract amount.

## **3RD TIER AND HIGHER CONTRACTOR**

1. Attach a copy of this completed form & list the 3rd tier contractor information under the 2nd tier

**STATEMENT OF INTENT TO PAY PREVAILING WAGES**  
**To Be Completed Before Construction Starts**  
**ALL FIELDS ARE REQUIRED**

**FORM MUST BE SENT TO THE CONTRACTING AGENCY WITHIN 3 DAY OF THE AWARD**

<b>General Contractor Information</b>		
Company Name:		
Address:		
City :	State:	Zip:
Phone:	Fax:	E-Mail:
Estimated Start Date:	<b>State Wage Decision Number:</b>	
Project Title:	Project Physical Address:	
<b>Total Contract Amount:</b>	Estimated Completion Date:	
Print Name:	General Contractor Signature:	
<b>Sub Contractor Information</b>		Start date on this project:
Sub Contract Amount:		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Sub Contractor Signature:	
<b>2<sup>nd</sup>, 3<sup>rd</sup>, etc. Tier Sub-Contractor Information</b>		Start date on this project:
Contract Amount:		
Company Name:		
Address:		
City:	State:	Zip:
Phone:	Fax:	E-Mail:
Print Name:	Tier Signature:	

I hereby certify that the above information is correct and that all workers I employ on this public works project will be paid no less than the Prevailing Wage Rate(s) as determined by the Department of Workforce Solutions, Labor Relations Division for this project as identified by the State Wage Decision Number. I understand that contractors who violate Prevailing Wage Laws (i.e., incorrect job classification, improper payment of prevailing wages, and/or overtime, etc.), are subject to debarment procedures and shall be required to pay any back wages due to workers. (Ref. Labor Relations Division, Public Works Minimum Wage Act Policy Manual (11.1.2 NMAC) & Public Works Minimum Wage Act (13-4-11 through 13-4-18, NMSA 1978).

Contractor's Signature                      Date

# PAYROLL STATEMENT OF COMPLIANCE

Wage Decision No. : \_\_\_\_\_

I, \_\_\_\_\_, do hereby state:

(Name of Signatory Party)

(Title)

(1) that I pay or supervise the payment of the persons employed by: \_\_\_\_\_

(Contractor or Subcontractor)

on the \_\_\_\_\_

(Name of Project)

that during the payroll period commencing on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_ and ending the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, all persons employed on said project have been paid the full weekly wages earned, that no deductions have been or will be made either directly or indirectly to or on behalf of said \_\_\_\_\_ from the full weekly wages earned by any

(Contractor or Subcontractor)

person, other than deductions permitted by law. Anyone found in violation of the NM Public Works Minimum Wage Act [13-4-11 to 13-4-17 NMSA 1978] could be subject to penalties and debarment.

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborer or mechanic conform with the work he performed.

(3) That any apprentice(s) employed in the above period are duly registered in a bona fide apprenticeship program registered with the State Apprenticeship agency recognized by the Bureau of Apprenticeship & Trng., US Dept. of Labor, or properly enrolled in a bona fide training program approved for application on public works construction projects by the appropriate state (SAC) and/or federal agency(ies) (BAT) if and as required by law & applicable federal regulation.

(4) **FRINGE BENEFITS: (Please Spell Out Any/All Acronyms)**

\_\_\_(a) ARE PAID TO APPROVED PLAN, FUND, OR PROGRAM in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above-referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate program for the benefit of such employees.

*If paid to an approved plan, fund, or program, please fill out name of program w/fringe breakdown per hour below.*

**Name of Program Used for Fringe Benefits:**

<b>Pension =</b>	<b>Health/Welfare =</b>	<b>Holiday/Vac. =</b>	<b>Life Ins. =</b>	<b>Training* =</b>
(If additional space is needed for more programs/fringe breakdowns, please attach a separate page.)				

FRINGE BENEFITS:

1. Pension

2. Health/Welfare

3. Holiday/Vacation

4. Life Insurance

5. Training (not Apprenticeship) \*

FRINGE BREAKDOWN SAMPLE:

Fringe Benefit:	Amount:
401(K) Plan	\$8.98/hr.
Vacation	\$2.23/hr.

\_\_\_(b) **Paid to Union Program** - If paid to a Union and fringe benefits differ from employee to employee, and/or job contract, please provide fringe breakdown for each employee and attach copy of Union contract.

\_\_\_(c) ARE PAID IN CASH, each laborer or mechanic listed in the above-referenced payroll has been paid as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract.

Section 13-1D-1 to Section 13-1D-8, NMSA 1978 provides for employers to agree to make contributions to approved apprentice & training programs in New Mexico in which the employer is a participant to the public works apprentice and training fund administered by the Public Works Bureau of the Labor & Industrial Division of the New Mexico State Department of Labor. Contributions shall be made in the same manner and in the same amount as apprentice and training contributions required pursuant to wage rate determinations made by the Labor & Industrial Division Director.

**APPRENTICESHIP CONTRIBUTIONS:** (Please check applicable blank)

\_\_\_ Check paid to: NM Public Works Apprenticeship & Training Fund - Public Works Bureau, Labor & Industrial Div.

\_\_\_ Check paid to: \_\_\_\_\_  
(Name & address of approved Apprenticeship & Training Program) (Program No.)

Print Name of Certifying Official: \_\_\_\_\_ Signature of Certifying Official: \_\_\_\_\_ Title & Phone No.: \_\_\_\_\_ Date: \_\_\_\_\_

The willful falsification of any of the above statements may subject the contractor or subcontractor to civil or criminal prosecution. See Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

Revised April/2006

## WEEKLY PAYROLL

Revised Feb/2014

[illegible]

## GENERAL PROVISIONS

### SECTION 10 DEFINITION OF TERMS

Whenever the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

**10-01 AASHTO.** The American Association of State Highway and Transportation Officials, the successor association to AASHO.

**10-02 ACCESS ROAD.** The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

**10-03 ADVERTISEMENT.** A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

**10-04 AIRPORT IMPROVEMENT PROGRAM (AIP).** A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

**10-05 AIR OPERATIONS AREA (AOA).** For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

**10-06 AIRPORT.** Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.

**10-07 ASTM INTERNATIONAL (ASTM).** Formerly known as the American Society for Testing and Materials (ASTM).

**10-08 AWARD.** The Owner's notice to the successful bidder of the acceptance of the submitted bid.

**10-09 BIDDER.** Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

**10-10 BUILDING AREA.** An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

**10-11 CALENDAR DAY.** Every day shown on the calendar.

**10-12 CHANGE ORDER.** A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, must be within the scope of the contract.

**10-13 CONTRACT.** The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract Form, Proposal, Performance Bond, Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

**10-14 CONTRACT ITEM (PAY ITEM).** A specific unit of work for which a price is provided in the contract.

**10-15 CONTRACT TIME.** The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

**10-16 CONTRACTOR.** The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

**10-17 CONTRACTOR'S LABORATORY.** The Contractor's quality control organization in accordance with the Contractor Quality Control Program.

**10-18 CONSTRUCTION SAFETY AND PHASING PLAN (CSPP).** The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

**10-19 DRAINAGE SYSTEM.** The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

**10-20 ENGINEER.** The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering and inspection of the contract work and acting directly or through an authorized representative.

**10-21 EQUIPMENT.** All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

**10-22 EXTRA WORK.** An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

**10-23 FAA.** The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.

**10-24 FEDERAL SPECIFICATIONS.** The Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government.

**10-25 FORCE ACCOUNT.** Force account work is planning, engineering, or construction work done by the Sponsor's employees.

**10-26 INSPECTOR.** An authorized representative of the Engineer assigned to make all necessary inspection and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

**10-27 INTENTION OF TERMS.** Whenever, in these specifications or on the plans, the words “directed,” “required,” “permitted,” “ordered,” “designated,” “prescribed,” or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words “approved,” “acceptable,” “satisfactory,” or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

**10-28 LABORATORY.** The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer. Also referred to as “Engineer’s Laboratory” or “quality assurance laboratory.”

**10-29 LIGHTING.** A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

**10-30 MAJOR AND MINOR CONTRACT ITEMS.** A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

**10-31 MATERIALS.** Any substance specified for use in the construction of the contract work.

**10-32 NOTICE TO PROCEED (NTP).** A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

**10-33 OWNER.** The term “Owner” shall mean the party of the first part or the contracting agency signatory to the contract. Where the term “Owner” is capitalized in this document, it shall mean airport Sponsor only.

**10-34 PASSENGER FACILITY CHARGE (PFC).** Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a “charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.”

**10-35 PAVEMENT.** The combined surface course, base course, and subbase course, if any, considered as a single unit.

**10-36 PAYMENT BOND.** The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.

**10-37 PERFORMANCE BOND.** The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

**10-38 PLANS.** The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

**10-39 PROJECT.** The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

**10-40 PROPOSAL.** The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

**10-41 PROPOSAL GUARANTY.** The security furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

**10-42 RUNWAY.** The area on the airport prepared for the landing and takeoff of aircraft.

**10-43 SPECIFICATIONS.** A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

**10-44 SPONSOR.** A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

**10-45 STRUCTURES.** Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

**10-46 SUBGRADE.** The soil that forms the pavement foundation.

**10-47 SUPERINTENDENT.** The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

**10-48 SUPPLEMENTAL AGREEMENT.** A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25%, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

**10-49 SURETY.** The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.

**10-50 TAXIWAY.** For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.

**10-51 WORK.** The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.

**10-52 WORKING DAY.** A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

## END OF SECTION 10

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## SECTION 20 PROPOSAL REQUIREMENTS AND CONDITIONS

### 20-01 ADVERTISEMENT (NOTICE TO BIDDERS).

This Project has been advertised on July 2, 6, 9, 11, 13 & 18, 2017.

**20-02 QUALIFICATION OF BIDDERS.** Each bidder shall furnish the Owner satisfactory evidence of his or her competency to perform the proposed work. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the Owner satisfactory evidence of his or her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his or her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

**20-03 CONTENTS OF PROPOSAL FORMS.** The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.

The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

**20-04 ISSUANCE OF PROPOSAL FORMS.** The Owner reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

- a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.
- b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.
- c. Documented record of Contractor default under previous contracts with the Owner.
- d. Documented record of unsatisfactory work on previous contracts with the Owner.

**20-05 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES.** An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as hereinafter provided in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 without in any way invalidating the unit bid prices.

**20-06 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE.** THE BIDDER IS EXPECTED TO CAREFULLY examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

**20-07 PREPARATION OF PROPOSAL.** The bidder shall submit his or her proposal on the forms furnished by the Owner. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals for which they propose to do for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign the proposal correctly and in ink. If the proposal is made by an individual, his or her name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his or her authority to do so and that the signature is binding upon the firm or corporation.

**20-08 RESPONSIVE AND RESPONSIBLE BIDDER.** A responsive bid conforms to all significant terms and conditions contained in the Sponsor's invitation for bid. It is the Sponsor's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 49 CFR § 18.36(b)(8). This includes such matters as

Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

**20-09 IRREGULAR PROPOSALS.** Proposals shall be considered irregular for the following reasons:

- a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.
- b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.
- c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.
- d. If the proposal contains unit prices that are obviously unbalanced.
- e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

**20-10 BID GUARANTEE.** Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such check, or collateral, shall be made payable to the Owner.

**20-11 DELIVERY OF PROPOSAL.** Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

**20-12 WITHDRAWAL OR REVISION OF PROPOSALS.** A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by ~~Fax~~ email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

**20-13 PUBLIC OPENING OF PROPOSALS.** Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

**20-14 DISQUALIFICATION OF BIDDERS.** A bidder shall be considered disqualified for any of the following reasons:

- a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.
- b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.
- c. If the bidder is considered to be in "default" for any reason specified in the subsection 20-04 titled ISSUANCE OF PROPOSAL FORMS of this section.

**END OF SECTION 20**

## **SECTION 30 AWARD AND EXECUTION OF CONTRACT**

**30-01 CONSIDERATION OF PROPOSALS.** After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

- a. If the proposal is irregular as specified in the subsection 20-09 titled IRREGULAR PROPOSALS of Section 20.
- b. If the bidder is disqualified for any of the reasons specified in the subsection 20-14 titled DISQUALIFICATION OF BIDDERS of Section 20.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

**30-02 AWARD OF CONTRACT.** The award of a contract, if it is to be awarded, shall be made within 120 calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest qualified bidder whose proposal conforms to the cited requirements of the Owner.

**30-03 CANCELLATION OF AWARD.** The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection 30-07 titled APPROVAL OF CONTRACT of this section.

**30-04 RETURN OF PROPOSAL GUARANTY.** All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the subsection 30-01 titled CONSIDERATION OF PROPOSALS of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned.

The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section.

**30-05 REQUIREMENTS OF CONTRACT BONDS.** At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise

specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

**30-06 EXECUTION OF CONTRACT.** The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section, within 15 calendar days from the date mailed or otherwise delivered to the successful bidder.

**30-07 APPROVAL OF CONTRACT.** Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

**30-08 FAILURE TO EXECUTE CONTRACT.** Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection 30-06 titled EXECUTION OF CONTRACT of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

#### END OF SECTION 30

## **SECTION 40 SCOPE OF WORK**

**40-01 INTENT OF CONTRACT.** The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

**40-02 ALTERATION OF WORK AND QUANTITIES.** The Owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25% (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25% limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by "Change Orders" issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25% limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

Supplemental agreements shall be approved by the FAA and shall include all applicable Federal contract provisions for procurement and contracting required under AIP. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds.

**40-03 OMITTED ITEMS.** The Engineer may, in the Owner's best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all authorized and accepted work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with the subsection 90-04 titled PAYMENT FOR OMITTED ITEMS of Section 90.

**40-04 EXTRA WORK.** Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called "Extra Work." Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer's opinion, is necessary for completion of such Extra Work.

When determined by the Engineer to be in the Owner's best interest, the Engineer may order the Contractor to proceed with Extra Work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as defined in the subsection 10-48 titled SUPPLEMENTAL AGREEMENT of Section 10.

Any claim for payment of Extra Work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

**40-05 MAINTENANCE OF TRAFFIC.** IT IS THE EXPLICIT INTENTION OF THE CONTRACT THAT THE SAFETY OF AIRCRAFT, as well as the Contractor's equipment and personnel, is the most important consideration.

- a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to his or her own operations and the operations of all subcontractors as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection 70-15 titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.
- b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport.
- c. When the contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall be responsible for the repair of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (<http://mutcd.fhwa.dot.gov/>), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.
- d. The cost of maintaining the aircraft and vehicular traffic specified in this Subsection shall not be measured or paid for directly, but shall be included in the various Contract Items.

**40-06 REMOVAL OF EXISTING STRUCTURES.** All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing

structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection 40-07 titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

The Contractor shall protect pavements which are to remain in place when removing adjacent pavements or structures. Falling-weight type pavement demolition will not be permitted within 25 feet of pavement to remain in place. Any pavement to remain in place which is damaged by the Contractor shall be removed and replaced in-kind at the Contractor's expense.

**40-07 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK.** Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be either embankment or waste, the Contractor may at his or her option either:

- a. Use such material in another contract item, providing such use is approved by the Engineer and is in conformance with the contract specifications applicable to such use; or,
- b. Remove such material from the site, upon written approval of the Engineer; or
- c. Use such material for the Contractor's own temporary construction on site; or,
- d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the Engineer's approval in advance of such use.

Should the Engineer approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at his or her own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his or her exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

**40-08 FINAL CLEANUP.** Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property Owner.

#### END OF SECTION 40

## **SECTION 50 CONTROL OF WORK**

**50-01 AUTHORITY OF THE ENGINEER.** The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

**50-02 CONFORMITY WITH PLANS AND SPECIFICATIONS.** All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order or supplemental agreement as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the Engineer's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use sound engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity, but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

The Engineer will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

**50-03 COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS.** The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the Engineer for an interpretation and decision, and such decision shall be final.

### LIST OF SPECIAL PROVISIONS

**See Special Provisions section of these Contract Documents.**

**50-04 COOPERATION OF CONTRACTOR.** The Contractor will be supplied with [~~five~~] copies each one CD of the plans and specifications. The Contractor shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the Engineer and his or her inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his or her agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his or her authorized representative.

**50-05 COOPERATION BETWEEN CONTRACTORS.** The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his or her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his or her work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join his or her work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

**50-06 CONSTRUCTION LAYOUT AND STAKES.** The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): .xls. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

Construction Staking and Layout includes but is not limited to:

- a. Clearing and Grubbing perimeter staking.
- b. Rough Grade slope stakes at 100-foot (30-m) stations.
- c. Drainage Swales slope stakes and flow line blue tops at 50-foot (15-m) stations.

Subgrade blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

- a. Runway – minimum five (5) per station.
- b. Taxiways – minimum three (3) per station.
- c. Holding apron areas – minimum three (3) per station.
- d. Roadways – minimum three (3) per station.

Base Course blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) offset distance (maximum) for the following section locations:

- a. Runway – minimum five (5) per station.

- b. Taxiways – minimum three (3) per station.
- c. Holding apron areas – minimum three (3) per station.

Pavement areas:

- a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot (30-m) stations.
- b. Between Lifts at 25-foot (7.5-m) stations for the following section locations:
  - (1) Runways – each paving lane width.
  - (2) Taxiways – each paving lane width.
  - (3) Holding areas – each paving lane width.
- c. After finish paving operations at 50-foot (15-m) stations:
  - (1) All paved areas – Edge of each paving lane prior to next paving lot.
- d. Shoulder and safety area blue tops at 50-foot (15-m) stations and at all break points with maximum of 50-foot (15-m) offsets.
- e. Fence lines at 100-foot (30-m) stations minimum.
- f. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.
- g. Drain lines, cut stakes and alignment on 25-foot (7.5-m) stations, inlet and manholes.
- h. Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting).
- i. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet (120 m) per pass (that is, paving lane).

The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

**50-07 AUTOMATICALLY CONTROLLED EQUIPMENT.** Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

**50-08 AUTHORITY AND DUTIES OF INSPECTORS.** Inspectors shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors are authorized to notify the Contractor or his or her representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for a decision.

**50-09 INSPECTION OF THE WORK.** All materials and each part or detail of the work shall be subject to inspection. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

The Engineer or Inspectors employed by the Owner are not responsible as a result of site visits and/or inspections of the Contractor's work in progress for supervising, directing or having control over the Contractor's Work nor are the Engineer or Inspectors employed by the Owner responsible for the means, methods, techniques, sequences or procedures of construction selected by the Contractor.

**50-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK.** All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection 50-02 titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the

provisions of the subsection 70-14 titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Section 70.

No removal work made under provision of this subsection shall be done without lines and grades having been approved by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as established by the Engineer, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs incurred by the Owner from any monies due or to become due the Contractor.

**50-11 LOAD RESTRICTIONS.** The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.

**50-12 MAINTENANCE DURING CONSTRUCTION.** The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

**50-13 FAILURE TO MAINTAIN THE WORK.** Should the Contractor at any time fail to maintain the work as provided in the subsection 50-12 titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

**50-14 PARTIAL ACCEPTANCE.** If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the Engineer may accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

**50-15 FINAL ACCEPTANCE.** Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

Prior to final acceptance, the Contractor shall submit all required material and equipment submittals, quality control and acceptance test results, surveys and record drawings to the Engineer in the form specified.

**50-16 CLAIMS FOR ADJUSTMENT AND DISPUTES.** If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer in writing of his or her intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

## END OF SECTION 50

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## SECTION 60 CONTROL OF MATERIALS

**60-01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS.** The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the Engineer as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the Engineer's option, materials may be approved at the source of supply before delivery is stated. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

- a. Listed in advisory circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,
- b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

The following airport lighting equipment is required for this contract and is to be furnished by the Contractor in accordance with the requirements of this subsection: See Technical Specifications.

**60-02 Samples, tests, and cited specifications.** Unless otherwise designated, all materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), Federal Specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids, will be made by and at the expense of the Engineer.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel, including the Contractor's representative at his or her request. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the Engineer. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the Engineer.

The Contractor shall employ a testing organization to perform all Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with ~~printed reports~~ electronic reports on forms provided by the Engineer in spreadsheet format (.xls or approved equal), ~~in an approved format~~, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

**60-03 CERTIFICATION OF COMPLIANCE.** The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "brand name," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

- a. Conformance to the specified performance, testing, quality or dimensional requirements; and,
- b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an "or equal" material or assembly, the Contractor shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The Engineer reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

**60-04 PLANT INSPECTION.** The Engineer or his or her authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

- a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom the Engineer has contracted for materials.
- b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.
- c. if required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

**60-05 ENGINEER'S FIELD OFFICE.** The Contractor shall furnish for the duration of the project one building for the use of the field Engineers and inspectors, as a field office. This facility shall be an approved weatherproof building meeting the current State Highway Specifications (for example, Class I Field Office or Type C Structure). This building shall be located conveniently near to the construction and shall be separate from any building used by the Contractor. The Contractor shall furnish facsimile (FAX) machine, cell phone with unlimited minutes, photocopy machine, water, sanitary facilities, heat, air conditioning, and electricity. The Contractor and the Contractor's superintendent shall provide all reasonable facilities to enable the Engineer to inspect the workmanship and materials used into the work.

**60-06 STORAGE OF MATERIALS.** Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property Owner's permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at his or her entire expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

**60-07 UNACCEPTABLE MATERIALS.** Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the Engineer has approved its use in the work.

**60-08 OWNER FURNISHED MATERIALS.** The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

**END OF SECTION 60**

## **SECTION 70**

### **LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC**

**70-01 LAWS TO BE OBSERVED.** The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his or her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

**70-02 PERMITS, LICENSES, AND TAXES.** The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

**70-03 PATENTED DEVICES, MATERIALS, AND PROCESSES.** If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

**70-04 RESTORATION OF SURFACES DISTURBED BY OTHERS.** The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) is indicated as follows: No work outside the Contract is anticipated.

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

**70-05 FEDERAL AID PARTICIPATION.** For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner's request to the FAA. In

consideration of the United States Government's (FAA's) agreement with the Owner, the Owner has included provisions in this contract pursuant to the requirements of Title 49 of the USC and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

**70-06 SANITARY, HEALTH, AND SAFETY PROVISIONS.** The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his or her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, State, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his or her health or safety.

Representatives of the Owner or the Engineer are not responsible during site visits or as a result of observations or inspections of the Contractor's work in progress for any safety precautions or programs incident to the Work of the Contractor or for any failure of the Contractor to comply with laws, rules, regulations, ordinances, codes or orders applicable to safety precautions or programs.

**70-07 PUBLIC CONVENIENCE AND SAFETY.** The Contractor shall control his or her operations and those of his or her subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers in accordance with the subsection 40-05 titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

**70-08 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS.** The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area (AOAs) shall be a maximum of 18 inches (0.5 m) high. Unless otherwise specified, barricades shall be spaced not more than 4 feet (1.2 m) apart. Barricades, warning signs, and markings shall be paid for under subsection 40-05.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of advisory circular (AC) 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and the Contractor's parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted.

**70-09 USE OF EXPLOSIVES.** When the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having structures or facilities in proximity to the site of the work of his or her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

**70-10 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE.** The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at his or her own expense, such property to a condition similar or equal to that existing before such

damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

**70-11 RESPONSIBILITY FOR DAMAGE CLAIMS.** The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his or her contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his or her surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

**70-12 THIRD PARTY BENEFICIARY CLAUSE.** It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

**70-13 OPENING SECTIONS OF THE WORK TO TRAFFIC.** Should it be necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his or her own estimate of the difficulties involved in arranging the work to permit such beneficial occupancy by the Owner as described below:

See Construction Safety and Phasing Plan. Airstrip to remain closed the duration of project.

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his or her expense.

The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

Contractor shall be required to conform to safety standards contained AC 150/5370-2 (see Special Provisions).

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP) to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

**70-14 CONTRACTOR'S RESPONSIBILITY FOR WORK.** Until the Engineer's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his or her expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

**70-15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS.** As provided in the subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the Owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the Owners are indicated as follows:

New Mexico One Call, Inc.  
(800) 321-2537

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of his or her plan of operations. Such notification

shall be in writing addressed to THE PERSON TO CONTACT as provided in this subsection and subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's PERSON TO CONTACT no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his or her surety.

**70-16 FURNISHING RIGHTS-OF-WAY.** The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

**70-17 PERSONAL LIABILITY OF PUBLIC OFFICIALS.** In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, his or her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

**70-18 NO WAIVER OF LEGAL RIGHTS.** Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his or her surety, or both, such

overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

**70-19 ENVIRONMENTAL PROTECTION.** The Contractor shall comply with all Federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

**70-20 ARCHAEOLOGICAL AND HISTORICAL FINDINGS.** Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his or her operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in the subsection 40-04 titled EXTRA WORK of Section 40 and the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

## END OF SECTION 70



## **SECTION 80 EXECUTION AND PROGRESS**

**80-01 SUBLETTING OF CONTRACT.** The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

The Contractor shall provide copies of all subcontracts to the Engineer. The Contractor shall perform, with his organization, an amount of work equal to at least 25 percent of the total contract cost.

Should the Contractor elect to assign his or her contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

**80-02 NOTICE TO PROCEED.** The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin. The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

**80-03 EXECUTION AND PROGRESS.** Unless otherwise specified, the Contractor shall submit their progress schedule for the Engineer's approval within 10 days after the effective date of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

**80-04 LIMITATION OF OPERATIONS.** The Contractor shall control his or her operations and the operations of his or her subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct his or her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection 70-08 titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

See Construction Safety and Phasing Plan. Shiprock Airstrip will remain closed the duration of the construction.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction (see Special Provisions).

**80-04.1 OPERATIONAL SAFETY ON AIRPORT DURING CONSTRUCTION.** All Contractors' operations shall be conducted in accordance with the project Construction Safety and Phasing Plan (CSPP) and the provisions set forth within the current version of AC 150/5370-2. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a Safety Plan Compliance Document that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer.

**80-05 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT.** The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the Engineer.

Should the Contractor fail to remove such persons or person, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work and suspend acceptance of completed prior work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this subsection.

**80-06 TEMPORARY SUSPENSION OF THE WORK.** The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods as the Owner may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the execution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his or her claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Owner, or for any other delay provided for in the contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the

work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

**80-07 DETERMINATION AND EXTENSION OF CONTRACT TIME.** The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

- a. CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his or her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his or her weekly statement of contract time charged on the following considerations:

- (1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least six (6) hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.
- (2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.
- (3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.
- (4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection 50-15 titled FINAL ACCEPTANCE of Section 50.
- (5) The Contractor will be allowed one (1) week in which to file a written protest setting forth his or her objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection 20-05 titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the

cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

- b. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

- c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond his or her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Owner for an extension of time setting forth the reasons which the Contractor believes will justify the granting of his or her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Owner may extend the time for completion by a change order that adjusts the contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

**80-08 FAILURE TO COMPLETE ON TIME.** For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his or her surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule	Liquidated Damages Cost	Allowed Construction Time
I & II	\$2,500	60 calendar days

The maximum construction time allowed for Schedules I & II will be the sum of the time allowed for individual schedules but not more than 60 days. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the contract.

**80-09 DEFAULT AND TERMINATION OF CONTRACT.** The Contractor shall be considered in default of his or her contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons if the Contractor:

- a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or
- b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or
- c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or
- d. Discontinues the execution of the work, or
- e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or
- f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or
- g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or
- h. Makes an assignment for the benefit of creditors, or
- i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the contract for any reason above, the Engineer shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such

other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

**80-10 TERMINATION FOR NATIONAL EMERGENCIES.** The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of the contract or a portion thereof shall neither relieve the Contractor of his or her responsibilities for the completed work nor shall it relieve his or her surety of its obligation for and concerning any just claim arising out of the work performed.

**80-11 WORK AREA, STORAGE AREA AND SEQUENCE OF OPERATIONS.** The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum of 300 feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within 300 feet of an active runway at any time.

## END OF SECTION 80

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## SECTION 90 MEASUREMENT AND PAYMENT

**90-01 MEASUREMENT OF QUANTITIES.** All work completed under the contract will be measured by the Engineer, or his or her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation, the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

The term "ton" will mean the short ton consisting of 2,000 lb (907 kg) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the Engineer in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts or ASTM D633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton (kg) or hundredweight (km).

Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1% of the nominal rated capacity of the scale, but not less than 1 pound (454 grams). The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1%.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

**90-02 SCOPE OF PAYMENT.** The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of the subsection 70-18 titled NO WAIVER OF LEGAL RIGHTS of Section 70.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

**90-03 COMPENSATION FOR ALTERED QUANTITIES.** When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his or her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

**90-04 PAYMENT FOR OMITTED ITEMS.** As specified in the subsection 40-03 titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

**90-05 PAYMENT FOR EXTRA WORK.** Extra work, performed in accordance with the subsection 40-04 titled EXTRA WORK of Section 40, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

**90-06 PARTIAL PAYMENTS.** Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection 90-07 titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. The Owner must ensure prompt and full payment of retainage from the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

From the total of the amount determined to be payable on a partial payment, ten (10) percent of such total amount will be deducted and retained by the Owner until the final payment is made, except as may be provided (at the Contractor's option) in the subsection 90-08 titled PAYMENT OF WITHHELD FUNDS of this section. The balance of the amount payable, less all previous payments, shall be certified for payment. Should the Contractor exercise his or her option, as provided in the subsection 90-08 titled PAYMENT OF WITHHELD FUNDS of this section, no such percent retainage shall be deducted.

When at least 95% of the work has been completed, the Engineer shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection 90-09 titled ACCEPTANCE AND FINAL PAYMENT of this section.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

**90-07 PAYMENT FOR MATERIALS ON HAND.** Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

- a. The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.
- b. The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
- c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.
- d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.
- e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

**90-08 PAYMENT OF WITHHELD FUNDS.** At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS,

the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

- a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.
- b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.
- c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.
- d. The Contractor shall obtain the written consent of the surety to such agreement.

**90-09 ACCEPTANCE AND FINAL PAYMENT.** When the contract work has been accepted in accordance with the requirements of the subsection 50-15 titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection 50-16 titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, and after the Engineer's receipt of the project closeout documentation required in subsection 90-11 Project Closeout, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection 50-16 titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

#### **90-10 CONSTRUCTION WARRANTY.**

- a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.
- b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner

takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

- c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of:
  - (1) The Contractor's failure to conform to contract requirements; or
  - (2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.
- d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.
- e. The Owner will notify the Contractor, in writing, within seven (7) days after the discovery of any failure, defect, or damage.
- f. If the Contractor fails to remedy any failure, defect, or damage within fourteen (14) days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.
- h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

**90-11 PROJECT CLOSEOUT.** Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

- a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.
- b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.
- c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.
- d. Complete all punch list items identified during the Final Inspection.
- e. Provide complete release of all claims for labor and material arising out of the Contract.

- f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.
- g. When applicable per state requirements, return copies of sales tax completion forms.
- h. Manufacturer's certifications for all items incorporated in the work.
- i. All required record drawings, as-built drawings or as-constructed drawings.
- j. Project Operation and Maintenance (O&M) Manual.
- k. Security for Construction Warranty.
- l. Equipment commissioning documentation submitted, if required.

**END OF SECTION 90**

## SECTION 100 CONTRACTOR QUALITY CONTROL PROGRAM

**100-01 GENERAL.** When the specification requires a Contractor Quality Control Program, the Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The intent of this section is to enable the Contractor to establish a necessary level of control that will:

- a. Adequately provide for the production of acceptable quality materials.
- b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.
- c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, their understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and accepted by the Engineer. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

Paving projects over \$500,000 shall have a Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Contractor, subcontractors, testing laboratories, and Owner's representative at start of construction. The workshop shall address QC and QA requirements of the project specifications. The Contractor shall coordinate with the Airport and the Engineer on time and location of the QC/QA workshop.

### **100-02 DESCRIPTION OF PROGRAM.**

- a. **General description.** The Contractor shall establish a Quality Control Program to perform quality control inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other

activities deemed necessary by the Contractor to establish an effective level of quality control.

- b. Quality Control Program.** The Contractor shall describe the Quality Control Program in a written document that shall be reviewed and approved by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review and approval at least 10 calendar days before the preconstruction conference. The Contractor's Quality Control Plan and Quality Control testing laboratory must be approved in writing by the Engineer prior to the Notice to Proceed (NTP).

The Quality Control Program shall be organized to address, as a minimum, the following items:

- a.** Quality control organization
- b.** Project progress schedule
- c.** Submittals schedule
- d.** Inspection requirements
- e.** Quality control testing plan
- f.** Documentation of quality control activities
- g.** Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that is deemed necessary to adequately control all production and/or construction processes required by this contract.

**100-03 QUALITY CONTROL ORGANIZATION.** The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall, as a minimum, consist of the following personnel:

- a. Program Administrator.** The Program Administrator shall be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of five (5) years of experience in airport and/or highway

construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

Additional qualifications for the Program Administrator shall include at least one of the following requirements:

- (1) Professional Engineer with one (1) year of airport paving experience.
- (2) Engineer-in-training with two (2) years of airport paving experience.
- (3) An individual with three (3) years of highway and/or airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.
- (4) Construction materials technician certified at Level III by the National Institute for Certification in Engineering Technologies (NICET).
- (5) Highway materials technician certified at Level III by NICET.
- (6) Highway construction technician certified at Level III by NICET.
- (7) A NICET certified engineering technician in Civil Engineering Technology with five (5) years of highway and/or airport paving experience.

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm. The Program Administrator may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

- b. Quality control technicians.** A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of two (2) years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

- (1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by subsection 100-06.
- (2) Performance of all quality control tests as required by the technical specifications and subsection 100-07.
- (3) Performance of density tests for the Engineer when required by the technical specifications.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

- c. **Staffing levels.** The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

**100-04 PROJECT PROGRESS SCHEDULE.** The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

**100-05 SUBMITTALS SCHEDULE.** The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:

- a. Specification item number
- b. Item description
- c. Description of submittal
- d. Specification paragraph requiring submittal
- e. Scheduled date of submittal

**100-06 INSPECTION REQUIREMENTS.** Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

- a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

- b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

**100-07 QUALITY CONTROL TESTING PLAN.** As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

- a. Specification item number (for example, P-401).
- b. Item description (for example, Plant Mix Bituminous Pavements).
- c. Test type (for example, gradation, grade, asphalt content).
- d. Test standard (for example, ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable).
- e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated).
- f. Responsibility (for example, plant technician).
- g. Control requirements (for example, target, permissible deviations).

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by subsection 100-08.

**100-08 DOCUMENTATION.** The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

- a. **Daily inspection reports.** Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:

- (1) Technical specification item number and description.
- (2) Compliance with approved submittals.
- (3) Proper storage of materials and equipment.
- (4) Proper operation of all equipment.
- (5) Adherence to plans and technical specifications.
- (6) Review of quality control tests.
- (7) Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

- b. **Daily test reports.** The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:

- (1) Technical specification item number and description
- (2) Test designation
- (3) Location
- (4) Date of test
- (5) Control requirements
- (6) Test results
- (7) Causes for rejection
- (8) Recommended remedial actions
- (9) Retests

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

**100-09 CORRECTIVE ACTION REQUIREMENTS.** The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

**100-10 SURVEILLANCE BY THE ENGINEER.** All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

**100-11 NONCOMPLIANCE.**

- a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his or her authorized representative to the Contractor or his or her authorized representative at the site of the work, shall be considered sufficient notice.
- b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:
  - (1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.
  - (2) Order the Contractor to stop operations until appropriate corrective actions are taken.

**END OF SECTION 100**

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## SECTION 110

### METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

**110-01 GENERAL.** When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average ( $\bar{X}$ ) and sample standard deviation ( $S_n$ ) of the specified number ( $n$ ) of sublots for the lot and the specification tolerance limits,  $L$  for lower and  $U$  for upper, for the particular acceptance parameter. From these values, the respective Quality index,  $Q_L$  for Lower Quality Index and/or  $Q_U$  for Upper Quality Index, is computed and the PWL for the lot for the specified  $n$  is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

**110-02 METHOD FOR COMPUTING PWL.** The computational sequence for computing PWL is as follows:

- a. Divide the lot into  $n$  sublots in accordance with the acceptance requirements of the specification.
- b. Locate the random sampling position within the subplot in accordance with the requirements of the specification.
- c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.
- d. Find the sample average ( $\bar{X}$ ) for all subplot values within the lot by using the following formula:

$$\bar{X} = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

Where:  $\bar{X}$  = Sample average of all subplot values within a lot  
 $x_1, x_2$  = Individual subplot values  
 $n$  = Number of sublots

- e. Find the sample standard deviation ( $S_n$ ) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \dots d_n^2) / (n - 1)]^{1/2}$$

Where:  $S_n$  = Sample standard deviation of the number of subplot values in the set

$d_1, d_2,$  = Deviations of the individual subplot values  $x_1, x_2, \dots$  from the average value  $X$

that is:  $d_1 = (x_1 - X), d_2 = (x_2 - X) \dots d_n = (x_n - X)$

$n$  = Number of sublots

- f. For single sided specification limits (i.e., L only), compute the Lower Quality Index  $Q_L$  by use of the following formula:

$$Q_L = (X - L) / S_n$$

Where:  $L$  = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with  $Q_L$ , using the column appropriate to the total number ( $n$ ) of measurements. If the value of  $Q_L$  falls between values shown on the table, use the next higher value of PWL.

- g. For double-sided specification limits (i.e. L and U), compute the Quality Indexes  $Q_L$  and  $Q_U$  by use of the following formulas:

$$Q_L = (X - L) / S_n \quad \text{and} \quad Q_U = (U - X) / S_n$$

Where:  $L$  and  $U$  = specification lower and upper tolerance limits

Estimate the percentage of material between the lower ( $L$ ) and upper ( $U$ ) tolerance limits (PWL) by entering Table 1 separately with  $Q_L$  and  $Q_U$ , using the column appropriate to the total number ( $n$ ) of measurements and determining the percent of material above PL and percent of material below PU for each tolerance limit. If the values of  $Q_L$  fall between values shown on the table, use the next higher value of  $P_L$  or  $P_U$ . Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where:  $P_L$  = percent within lower specification limit

$P_U$  = percent within upper specification limit

### EXAMPLE OF PWL CALCULATION

**Project:** Example Project

**Test Item:** Item P-401, Lot A

#### a. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

A-1 = 96.60

A-2 = 97.55

A-3 = 99.30  
 A-4 = 98.35  
 n = 4

2. Calculate average density for the lot.

$X = (X_1 + X_2 + X_3 + \dots + X_n) / n$   
 $X = (96.60 + 97.55 + 99.30 + 98.35) / 4$   
 $X = 97.95$  percent density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2) / (4 - 1)]^{1/2}$   
 $S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$   
 $S_n = 1.15$

4. Calculate the Lower Quality Index  $Q_L$  for the lot. ( $L = 96.3$ )

$Q_L = (X - L) / S_n$   
 $Q_L = (97.95 - 96.30) / 1.15$   
 $Q_L = 1.4348$

5. Determine PWL by entering Table 1 with  $Q_L = 1.44$  and  $n = 4$ .

PWL = 98

**b. PWL Determination for Air Voids.**

1. Air Voids of four random samples taken from Lot A.

A-1 = 5.00  
 A-2 = 3.74  
 A-3 = 2.30  
 A-4 = 3.25

2. Calculate the average air voids for the lot.

$X = (X_1 + X_2 + X_3 + \dots + X_n) / n$   
 $X = (5.00 + 3.74 + 2.30 + 3.25) / 4$   
 $X = 3.57$  percent

3. Calculate the standard deviation  $S_n$  for the lot.

$S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$   
 $S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$   
 $S_n = 1.12$

4. Calculate the Lower Quality Index  $Q_L$  for the lot. ( $L = 2.0$ )

$Q_L = (X - L) / S_n$

$$Q_L = (3.57 - 2.00) / 1.12$$

$$Q_L = 1.3992$$

5. Determine  $P_L$  by entering Table 1 with  $Q_L = 1.41$  and  $n = 4$ .

$$P_L = 97$$

6. Calculate the Upper Quality Index  $Q_U$  for the lot. ( $U = 5.0$ )

$$Q_U = (U - X) / S_n$$

$$Q_U = (5.00 - 3.57) / 1.12$$

$$Q_U = 1.2702$$

7. Determine  $P_U$  by entering Table 1 with  $Q_U = 1.29$  and  $n = 4$ .

$$P_U = 93$$

8. Calculate Air Voids PWL

$$PWL = (P_L + P_U) - 100$$

$$PWL = (97 + 93) - 100 = 90$$

#### EXAMPLE OF OUTLIER CALCULATION (Reference ASTM E 178)

**Project:** Example Project

**Test Item:** Item P-401, Lot A

##### a. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A. arranged in descending order.

$$A-3 = 99.30$$

$$A-4 = 98.35$$

$$A-2 = 97.55$$

$$A-1 = 96.60$$

2. Use  $n = 4$  and upper 5 percent significance level to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation and test criterion value to evaluate density measurements.

- a. For measurements greater than the average:  
If (measurement - average) / (standard deviation) is less than test criterion,

Then the measurement is not considered an outlier

for A-3 check if  $(99.30 - 97.95) / 1.15$  greater than 1.463  
since 1.174 is less than 1.463, the value is not an outlier.

- b.** For measurements less than the average:  
If  $(\text{average} - \text{measurement}) / (\text{standard deviation})$  is less than test  
criterion, then the measurement is not considered an outlier.

for A-1 Check if  $(97.95 - 96.60) / 1.15$  greater than 1.463.  
since 1.435 is less than 1.463, the value is not an outlier.

**NOTE:** In this example, a measurement would be considered an outlier if  
the density were:

greater than  $(97.95 + 1.463 \times 1.15) = 99.63$  percent or,  
less than  $(97.95 - 1.463 \times 1.15) = 96.27$  percent

**Table 1. Table for Estimating Percent of Lot Within Limits (PWL)**

Percent Within Limits (P <sub>L</sub> and P <sub>U</sub> )	Positive Values of Q (Q <sub>L</sub> and Q <sub>U</sub> )							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P <sub>L</sub> and P <sub>U</sub> )	Negative Values of Q (Q <sub>L</sub> and Q <sub>U</sub> )							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

END OF SECTION 110

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**ITEM S-1  
MOBILIZATION**

**DESCRIPTION**

**S-1-1.1** This Work consists of the mobilization of personnel, equipment and supplies to the Project site in preparation for Work on the Project. This item shall also include the establishment of the Contractor's offices, buildings and other necessary facilities and all other costs incurred for labor and operation which must be performed prior to beginning the other items under the Contract.

**BASIS OF PAYMENT**

**S-1-2.1** Partial payments for mobilization will be made once each month as the Work progresses. These partial payments will be made as follows:

**a.** When 5 percent of the Original Contract Amount is earned, 25 percent of the amount bid for mobilization, or 2 ½ percent of the original contract amount, whichever is less, will be paid.

**b.** When 10 percent of the Original Contract Amount is earned, 50 percent of the amount bid for mobilization, or 5 percent of the original contract amount, whichever is less, will be paid.

**c.** When 25 percent of the Original Contract Amount is earned, 60 percent of the amount bid for mobilization, or 6 percent of the original contract amount, whichever is less, will be paid.

**d.** When 50 percent of the Original Contract Amount is earned, 100 percent of the amount bid for mobilization, or 10 percent of the original contract amount, whichever is less, will be paid.

**e.** Upon completion of all work on the project, payment on any amount bid for mobilization in excess of 10 percent of the original contract amount will be paid.

**f.** The total sum of all payments shall not exceed the Original Contract Amount bid for the item, regardless of the fact that the Contractor may have, for any reason, shut down the Work on the Project or moved equipment away from the Project and then back again.

Payments for materials on hand will not be included as a percent of Original Contract Amount earned until said materials in hand have been incorporated into the Work and accepted and paid for as contract items.

Payment will be full compensation for all Work necessary to complete the item.

Payment will be made under:

Item S - 1      Mobilization - Per lump sum

**END OF ITEM S-1**

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## **ITEM S-2 REMOVALS**

### **DESCRIPTION**

**S-2-1.1** This Work consists of the removal and disposal of concrete foundations, pipes, inlets, duct banks, light poles, light cans, light cables, asphalt pavement, and any other obstructions that are not designated or permitted to remain. It shall also include salvaging, stockpiling and loading salvable materials, sandblasting, plugging structures, cleaning culverts, and sawing and cutting to facilitate controlled breaking and removal of concrete and asphalt to a neat line. Except in areas to be excavated, the resulting trenches, holes, and pits shall be backfilled.

Materials removed and not designated to be salvaged or incorporated into the Work shall become the property of the Contractor and shall be disposed of off the Airport property in accordance with all local, State, and Federal legal requirements. No construction waste shall be given out to the public during reconstruction activities.

### **GENERAL**

**S-2-2.1** The Contractor shall raze, remove, and dispose of all structures and obstructions which are identified on the Project, except utilities, structures and obstructions removed under other Contractual Agreements.

Fence removals shall include backfilling all post holes with suitable material.

Cavities left by structure removal shall be filled to the level of the surrounding ground with suitable material and, if within the construction limits, shall be compacted in accordance with Section P-152.

Culverts and other drainage structures shall not be removed until satisfactory arrangements have been made to accommodate drainage.

Operations used to remove existing structures or obstructions, which may damage new construction, shall be completed prior to placing the new Work.

Where portions of structures are to be removed, the portions designated to remain shall be prepared to fit the new construction, and shall be protected from damage. All damage to structures designated to remain in place shall be repaired at the Contractor's expense. Method of repair shall be approved by the Engineer.

Sawing of concrete or asphalt shall be done to a true line, with a vertical face, unless otherwise specified. The minimum depth of a saw cut in concrete shall be 2 inches or to the depth of the reinforcing steel, whichever occurs first. Sawing is considered incidental.

Removed materials, not designated to be salvaged, shall be hauled off Airport property and properly disposed of by the Contractor.

### **SALVABLE MATERIAL**

**S-2-3.1** All salvable material designated in the Contract to be relocated or remain the property of the Airport shall be removed without damage, in sections or pieces which may be readily transported, and shall be stockpiled by the Contractor at specified locations within the Project limits. The Contractor shall safeguard salvable materials and shall be responsible for the expense of repairing or replacing damaged or missing material until it is incorporated into the Work.

## PORTIONS OF STRUCTURES

**S-2-4.1** Unless otherwise directed, the substructures of existing structures shall be removed to 1 foot below natural ground surface. Where such portions of existing structures lie wholly or in part within the limits of a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure

Reinforcing steel projecting from the structure, designated to remain, shall be cleaned and aligned to the new construction. Required dowels shall be securely grouted with approved grout. When concrete is removed, all exposed reinforcing steel designated to remain in place shall be cleaned by sandblasting to sound steel free of oil, dirt, concrete fragments or laitance, loose rust scale, and other coatings that would destroy or inhibit the bond with the new concrete.

Adequate measures shall be taken by the Contractor to protect the steel from contamination or corrosion. Reinforcing steel, contaminated as a result of the Contractor's failure to provide adequate protection, shall be re-sandblasted at the Contractor's expense with no allowance for Contract Time Extension.

A protective device shall be placed between the sandblasting operations and the traveling public.

## REMOVAL OF ASPHALT MAT (FULL DEPTH)

**S-2-6.1** This Work consists of the complete removal of designated asphalt pavements. Any asphalt thicknesses shown on the plans are based on available records and are approximate. Variations in asphalt pavement thicknesses shall be verified by the Contractor prior to establishing the Contract Unit Price Bid and shall be included in the Contract Unit Price as Bid.

## METHOD OF MEASUREMENT

**S-2-7.1** The Contract provides for payment for the removal of specific items on a unit basis and measurement will be by the unit completed and accepted.

## BASIS OF PAYMENT

**S-2-8.1** The accepted quantities will be paid for at the Contract Unit Price for each of the pay items listed below. Payment shall be full compensation for sawing, removing, disposal, excavation and subsequent backfill, and salvage of materials removed, their custody, preservation, storage, and disposal as provided herein. All other items removed in order to construct various items of Work shall be considered incidental to and included in the cost of the related pay item.

Payment will be made under:

Item S-2a	Pulverize Asphalt Mat (3 inches) - per square yard
Item S-2b	Remove and Dispose Asphalt Mat (3 inches) - per square yard
Item S-2c	Remove Existing Lighting System and Appurtenances – per lump sum
Item S-2d	Remove Existing Culverts – per linear foot
Item S-2e	Remove and Replace Entrance Gates – per lump sum

## END OF ITEM S-2

**ITEM S-4  
PREPARE EXISTING SUBGRADE**

**DESCRIPTION**

**S-4-1.1** This Work consists of testing, scarifying (if necessary), grading, wetting and recompact (if necessary) the designated existing subgrade areas in preparation for the construction of the new pavement section.

**CONSTRUCTION METHODS**

**S-4-2.1** The surface of the existing subgrade area which is to be paved shall be scarified, if necessary, to a depth adequate to achieve the required density. Maximum particle size shall not exceed 2 inches. The material in the layer shall then be shaped to the subgrade elevations shown on the Plans and compacted.

Subgrade material shall be re-compacted, if necessary, in accordance with paragraph P-152-2.6.

In those areas where borrow material is required to bring the pavement subgrade up to Plan elevations, the borrow used shall conform to the material requirements of P-152 Borrow Material. Grading to plan elevations shall be included in this Work and no separate measurement or payment will be made.

**ACCEPTANCE SAMPLING AND TESTING FOR DENSITY**

**S-4-3.1** Prepared existing subgrade shall be accepted for density on a lot basis. A lot will consist of 1,000 square yards.

Each lot shall be divided into 2 equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.

Each lot will be accepted for density when the field density meets the requirements of paragraph P-152-2.6. The specimens shall be compacted and tested in accordance with ASTM D 698. The in-place field density shall be determined in accordance with ASTM D 1556 or D 6938. If the specified density is not attained, the entire lot shall be reworked and/or recompact and 2 additional random tests made. This procedure shall be followed until the specified density is reached.

Use of ASTM D 6938 results in a wet unit weight, and when using this method, ASTM D 6938 shall be used to determine the moisture content of the material. The calibration curve furnished with the moisture gages shall be checked as described in ASTM D 6938. The calibration checks of both the density and moisture gages shall be made at the beginning of a job and at intervals as determined by the Engineer.

If a nuclear gage is used for density determination, 2 random readings shall be made for each subplot.

**MAINTENANCE**

**S-4-4.1** The subgrade material shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the subgrade, provided no damage results and provided that the equipment is routed over the full width of the subgrade to avoid rutting or uneven compaction.

**METHOD OF MEASUREMENT**

**S-4-5.1** The quantity of prepared existing subgrade to be paid for will be determined by measurement of the number of square yards of material actually constructed and accepted by the Engineer as complying with the Plans and Specifications.

**BASIS OF PAYMENT**

**S-4-6.1** Payment shall be made at the Contract Unit Price per square yard for prepared existing subgrade. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all testing, labor, equipment tools, and incidentals necessary to complete the item including any borrow, haul, and placement of additional material to grade to Plan elevations.

Payment will be made under:

Item S-4      Prepare Existing Subgrade - per square yard

**TESTING REQUIREMENTS**

ASTM C 29      Unit Weight of Aggregate

ASTM D 75      Sampling Aggregate

ASTM D 698      Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 5.5-pound Rammer and 12-inch Drop

ASTM D 1556      Density of Soil In-Place by the Sand - Cone Method

ASTM D 6938      Standard Test Method for In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods

ASTM D 3665      Random Sampling of Paving Materials

**END OF ITEM S-4**

**ITEM S-6  
WATERING****DESCRIPTION**

**S-6-1.1** This item shall consist of furnishing and applying water required in the compaction of embankments, subgrades, subbases, base courses, for dust control, and for other purposes in accordance with the requirements of these Specifications or as directed by the Engineer.

**CONSTRUCTION METHODS**

**S-6-2.1** Water, when required, shall be applied at the locations, in the amounts, and during the hours, including nights, as directed by the Engineer. An adequate water supply shall be provided by the Contractor. The equipment used for watering shall be of ample capacity and of such design as to assure uniform application of water in the amounts directed by the Engineer.

**METHOD OF MEASUREMENT**

**S-6-3.1** No measurement will be made of water on any part of the Work. If any material is prewetted prior to weighing, the weight of the water shall be deducted from the scale weight.

**BASIS OF PAYMENT**

**S-6-4.1** No payment will be made separately or directly for water on any part of the Work. Water will be considered a necessary and incidental part of the Work and the Contractor shall include its cost in the Contract Unit Price for the pay items of Work involved.

**END OF ITEM S-6**

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## ITEM P-151 CLEARING AND GRUBBING

### DESCRIPTION

**151-1.1** This item shall consist of clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the Engineer.

**a. Clearing** shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.

**b. Clearing and grubbing** shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the Engineer is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing.

### CONSTRUCTION METHODS

**151-2.1 GENERAL.** The areas denoted on the plans to be cleared or cleared and grubbed shall be staked on the ground by the Engineer. The clearing and grubbing shall be done at a satisfactory distance in advance of the grading operations.

All spoil materials removed by clearing or by clearing and grubbing shall be disposed of outside the Airport's limits at the Contractor's responsibility, except when otherwise directed by the Engineer. As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry that cannot be used in construction and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the Engineer and shall not create an unsightly or objectionable view. When the Contractor is required to locate a disposal area outside the airport property limits, the Contractor shall obtain and file with the Engineer permission in writing from the property owner for the use of private property for this purpose.

Blasting shall not be allowed.

The removal of existing structure and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone or telegraph pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the Engineer who will notify the proper local authority or owner to secure prompt action.

**151-2.2 CLEARING.** The Contractor shall clear the staked or indicated area of all objectionable materials. Trees unavoidably falling outside the specified clearing limits must be cut up, removed, and disposed of in a satisfactory manner. To minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The Contractor shall preserve

and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of as directed by the Engineer. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a location designated by the Engineer if the fence is to remain the property of a local owner or authority.

**151-2.3 CLEARING AND GRUBBING.** In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed, except where embankments exceeding 3-1/2 feet (105 cm) in depth will be constructed outside of paved areas. For embankments constructed outside of paved areas, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and other projections over 1-1/2 inches (38 mm) in diameter shall be grubbed out to a depth of at least 18 inches (0.5 m) below the finished subgrade or slope elevation.

Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials shall be disposed of by removal from the site. The cost of removal is incidental to this item. The remaining or existing foundations, wells, cesspools, and like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet (60 cm) below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material that cannot be used in backfill shall be removed and disposed of at the Contractor's expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes under embankment areas remaining after the grubbing operation shall have the sides of the holes flattened to facilitate filling with acceptable material and compacting as required in Item P-152. The same procedure shall be applied to all holes remaining after grubbing in areas where the depth of holes exceeds the depth of the proposed excavation.

#### **METHOD OF MEASUREMENT**

**151-3.1** Clearing and grubbing shall not be measured for payment.

#### **BASIS OF PAYMENT**

**151-4.1** No direct payment shall be made for clearing and grubbing. The cost of furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item shall be incidental to and included in the Contract Unit Price.

#### **END OF ITEM P-151**

**ITEM P-152  
EXCAVATION, SUBGRADE, AND EMBANKMENT**

**DESCRIPTION**

**152-1.1** This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

**152-1.2 CLASSIFICATION.** All material excavated shall be classified as defined below:

**a.** Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature.

**152-1.3 UNSUITABLE EXCAVATION.** Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer.

**152-1.4 SUBGRADE PREPARATION.** This item covers the preparation of the underlying subgrade directly below and prior to placement of any new subbase or base course layer. This area shall meet the compaction requirements of section 152-2.6 and shall also meet the tolerances specified in section 152-2.9.

**152-1.5 OVEREXCAVATION.** Overexcavation shall include all work to remove, blend, place, and recompact materials from the areas under pavement structures that are deemed by the Engineer to be unsuitable for pavement subgrades. Overexcavation will include the removal and replacement of materials to provide a uniform blend under subgrade material on which pavement and structural foundations are to be placed. Depth of overexcavation shall be as shown on the plans or as directed by the Engineer. Recompacted materials shall meet the compaction and moisture content requirements of section 152-2.5 Formation of Embankments. Overexcavation may consist of importing pit-run material on an as needed basis for stabilization purposes. The pit-run material shall be obtained at an off-site source of the Contractor's choice and location

**CONSTRUCTION METHODS**

**152-2.1 GENERAL.** Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans or as directed by the Engineer. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per

subsection 70-20. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

**152-2.2 EXCAVATION.** No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained current elevations and measurements of the ground surface from the Contractor in a complete usable format approved by the Engineer. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development or disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

**a. Selective grading.** When selective grading is indicated on the plans, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas.

**b. Undercutting.** Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation". The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans.

**c. Overbreak.** Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation."

**d. Removal of utilities.** The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by someone other than the Contractor; for example, the utility unless otherwise shown on the plans. All existing foundations shall be excavated at least 2 feet (60 cm) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified.

**e. Compaction requirements.** The subgrade under areas to be paved shall be compacted to a depth of 6-inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D 698. The material to be compacted shall be within  $\pm 2\%$  of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). Non-cohesive soils for the purpose of determining compaction control are those with a Plastic Index of less than 3. Expansive soils shall be defined as soils having percent swells of greater than 3 percent (as determined by ASTM D 1883). If soils with this characteristic are encountered then they shall be removed overexcavated at the Engineer's discretion.

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet (300 m) ahead of the paving operations or as directed by the Engineer.

On all areas outside of the pavement areas, no compaction will be required on the top 4 in. The lower layers shall be compacted to 95% of the maximum density from ASTM D 1557 for non-cohesive soils and 90% for cohesive soil.

Per ASTM D 1557, compaction of soils that contain more than 30% retained on the  $\frac{3}{4}$ -inch sieve shall use a test-fill- section to determine the required degree of compaction, and the method to obtain the compaction.

Components of a method specification shall specify the type and size of compaction equipment, the lift thickness, acceptable ranges of molding water content, and the number of passes.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

**f. Proof rolling.** After compaction is completed, the subgrade area shall be proof rolled with a 20-ton Tandem Axle Dual Wheel Dump Truck with tires inflated to 100 psi or a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds (13.6 metric tons) and inflated to a minimum of 125 psi (0.861 MPa) in the presence of the Engineer. Apply a minimum of 3 coverage, or as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

**152-2.3 BORROW EXCAVATION.** Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary measurements and tests can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines to permit accurate measurements, and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

**152-2.4 DRAINAGE EXCAVATION.** Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

**152-2.5 PREPARATION OF EMBANKMENT AREA.** Where an embankment is to be constructed to a height of 4 feet (1.2 m) or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (150 mm) and shall then be compacted as indicated in paragraph 152-2.6. When the height of fill is greater than 4 feet (1.2 m), sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (300 mm) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

**152-2.6 FORMATION OF EMBANKMENTS.** Embankments shall be formed in successive horizontal layers of not more than 8 inches (200 mm) in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer. No placement of embankment material shall be started until the work has been staked out by the Contractor and the Engineer has obtained current elevations and measurements of the ground surface from the Contractor in a complete electronic and usable format.

The layers shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within  $\pm 2\%$  of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each 1,000 square yards of material placed. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than 95% of maximum density for noncohesive soils, and 90% of maximum density for cohesive soils as determined by ASTM D 698. Under all areas to be paved, the embankments shall be compacted to a depth of 6 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D 698 for cohesive soils, and to a depth of 24 inches and to a density of not less than 100 percent of the maximum density as determined by ASTM D 1557 for non-cohesive soils. The material to be compacted shall be within  $\pm 2\%$  of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). Non-cohesive soils for the purpose of determining compaction control are those with a Plastic Index of less than 3. Expansive soils shall be defined as soils having percent swells of greater than 3 percent (as determined by ASTM D 1883). If soils with this characteristic are encountered then they shall be removed overexcavated at the Engineer's discretion.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches (100 mm). The lower layers shall be compacted to 95% of the maximum density from ASTM D 1557 for non-cohesive soils and 90% for cohesive soil.

The in-place field density shall be determined in accordance with ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. All acceptance testing shall be done by a laboratory hired by the Engineer. The results shall be furnished daily to the Engineer for determination of acceptance.

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 6 inches (150 mm) of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2 feet (60 cm) in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4 feet (1.2 m) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

**152-2.7 FINISHING AND PROTECTION OF SUBGRADE.** After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

**152-2.8 HAUL.** All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

**152-2.9 TOLERANCES.** In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot (3.7-m) straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch (12 mm), or shall not be more than 0.05 feet (15 mm) from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet (3 mm) from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

A 12-foot straight edge shall be provided by the contractor, and made available to the engineer at all times for testing of surface smoothness tolerances.

**152-2.10 TOPSOIL.** Topsoil is not required for this project.

### **METHOD OF MEASUREMENT**

**152-3.1** For payment specified by the cubic yard, measurement for all excavation shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation cross-sections shown on the plans, subject to verification by the Engineer. Calculations included adjustments to allow for pavement templates thickness. Calculations are unadjusted and do not include any estimate of "shrinkage" for embankment.

No measurement of the plan excavation quantity shall be made. Plan quantities include all ditches, "grading to drain" areas and adjustments for stripping of vegetation areas and adjustments for pavement templates. Plan quantities do not include rehandling and processing/compaction of designated minimum thickness of subgrade under areas to be paved. Payment will be based on plan quantities.

If plan width of excavations are changed by more than  $\pm 1.0$  foot; and/or Plan elevations of excavations are changed by more than  $\pm 0.5$  foot the volume of the changes will be measured and the bid quantity of excavations will be adjusted to coincide with the changes.

Measurement of changes shall not include the quantity of material placed or removed without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

Shoulder grading shall be measured by the square yard of designated area bladed adjacent to pavements. This measurement shall count for all required grading between the pavement edge and the required edge of grading to provide grades and the shoulder slopes shown on the plans.

### **BASIS OF PAYMENT**

**152-4.1** "Unclassified excavation" payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. No direct payment shall be made for embankment or for processing and compaction of subgrade under proposed pavements.

There will be no separate payment for haul of any excavation or embankment materials or for placement and compaction of any material. All costs incidental to clearing and grubbing, hauling, embankments construction, processing and compaction of subgrade under areas to be paved, disposal of unsuitable materials and other necessary operations for construction of

excavations or embankments shall be included in the Contract Unit Prices for "Unclassified Excavation."

More material will be excavated than is required for the construction of embankments. For Schedule I, approximately 5,400 c.y. of embankment is required. This volume is unadjusted and does not include any estimate of "shrinkage." The excess material shall be wasted on the Airport as directed by the Airport Manager.

For "Shoulder Grading," payment shall be made at the Contract Unit Price per square yard completed and accepted. This price shall be full compensation for furnishing all materials including any borrow that may be required, labor, equipment, tools and incidentals necessary to complete the items.

Payment will be made under:

- Item P-152a   Unclassified Excavation (Runway) - per cubic yard
- Item P-152b   Unclassified Excavation (Taxiway) - per cubic yard
- Item P-152c   Shoulder / RSA Grading – per cubic yard
- Item P-152d   Unclassified Excavation (Holding Bay) – per cubic yard

#### **TESTING REQUIREMENTS**

- ASTM D698   Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
- ASTM D1556   Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- ASTM D1557   Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2700 kN-m/m<sup>3</sup>))
- ASTM D2167   Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- ASTM D6938   Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

#### **END OF ITEM P-152**

## ITEM P-154 SUBBASE COURSE

### DESCRIPTION

**154-1.1** This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

### MATERIALS

**154-2.1 MATERIALS.** The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetative matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the gradation requirements specified.

### GRADATION REQUIREMENTS

Sieve designation (square openings) as per ASTM C136 and ASTM D422	Percentage by weight passing sieves
3 inch (75 mm)	100
No. 10 (2.0 mm)	20-100
No. 40 (0.450 mm)	5-60
No. 200 (0.075 mm)	0-8

The portion of the material passing the No. 40 (0.450 mm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D4318.

**154-2.2 SAMPLING AND TESTING.** Material used on the project shall be sampled per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the Engineer by the Contractor prior to the start of construction and once per day during construction.

### CONSTRUCTION METHODS

**154-3.1 GENERAL.** The subbase course shall be placed where designated on the plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically stabilized to the depth necessary to provide stability as directed by the Engineer. The mechanical stabilization shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the specified limits.

**154-3.2 OPERATION IN PITS.** The subbase material shall be obtained from pits or sources that have been approved by the Engineer. The material in the pits shall be excavated and handled to produce a uniform and satisfactory product. All work involved in clearing and stripping pits and handling unsuitable material encountered shall be performed by the Contractor. The cost of this work is incidental to this item.

**154-3.3 PREPARING UNDERLYING COURSE.** Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Correct ruts, or soft yielding spots, in the underlying courses and subgrade areas having inadequate compaction and deviations of the surface from the specified requirements by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course. Accomplish stabilization by mixing the overlying course material into the underlying course, and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements for the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The course shall be checked and accepted by the Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

**154-3.4 MATERIALS ACCEPTANCE IN EXISTING CONDITION.** When the entire subbase material is in a uniform and satisfactory condition at approximately the required moisture content, the approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The intent of the specifications is to secure materials that will not require further mixing. The moisture content of the material shall be approximately that required to obtain maximum density. Any minor deficiency or excess in moisture content may be corrected by surface sprinkling or by aeration. Some mixing or aeration may be required prior to rolling to obtain the required moisture content. Blading or dragging, if necessary, shall be performed to obtain a smooth uniform surface true to line and grade.

**154-3.5 PLANT MIXING.** When materials from several sources will be blended and mixed, the subbase material shall be processed in a central or travel mixing plant. The subbase material, together with any blended material, shall be thoroughly mixed with the required amount of water. After the mixing is complete, the material shall be transported to and spread on the underlying course without undue loss of moisture content.

**154-3.5.1 MIXED IN PLACE.** When materials from different sources are to be proportioned and mixed or blended in place, the relative proportions of the components of the mixture shall be as designated by the Engineer.

The subbase material shall be deposited and spread evenly to a uniform thickness and width. Then the binder, filler or other material shall be deposited and spread evenly over the first layer.

There shall be as many layers of materials added as the Engineer may direct to obtain the required subbase mixture.

When the required amount of materials have been placed, they shall be thoroughly mixed and blended by means of graders, discs, harrows, rotary tillers, supplemented by other suitable equipment if necessary. The mixing shall continue until the mixture is uniformly blended. Areas of segregated material shall be corrected by the addition of binder or filler material and by thorough remixing. Water shall be uniformly applied prior to and during the mixing operations, if necessary, to maintain the material at its required moisture content. When the mixing and blending has been completed, the material shall be spread in a uniform layer which, when compacted, will meet the requirements of thickness and typical cross-section.

**154-3.6 GENERAL METHODS FOR PLACING.** The subbase course shall be constructed in layers of not less than inches (75 mm) nor more than 8 inches (200 mm) of compacted thickness. The subbase material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. The subbase, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards (1700 sq m) in advance of the rolling. Any necessary sprinkling shall be kept within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described here shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

**154-3.7 FINISHING AND COMPACTING.** After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course.

The field density of the compacted material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D698. The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The moisture content of the material at the start of compaction shall be within  $\pm 2\%$  of the optimum moisture content. All testing shall be done by the Contractor's laboratory in the presence of the Engineer, and density test results shall be furnished upon completion to the Engineer for acceptance determination.

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 3/8-inch (9 mm) when tested with a 12 feet (3.7 m) straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Sprinkling during rolling, if necessary, shall be by equipment approved by the Engineer. Water shall not be added in manner or quantity that allows free water to reach the underlying layer and cause it to become soft.

**154-3.8 SURFACE TOLERANCE.** The surface of the top layer shall show no deviations in excess of 3/8 inch (9 mm) when tested with a 12-foot (3.7-m) straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

**154-3.9 THICKNESS CONTROL.** The completed thickness of the course(s) shall be in accordance with the thickness and grade indicated on the drawings. The completed course shall not be more than 1/2 inch (12 mm) deficient in thickness nor more than 1/2 inch (12 mm) above or below the established grade. Where any of these tolerances are exceeded, correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness is 1/2 inch (12 mm) or thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 1/2 inch (12 mm). The average job thickness shall be the average of the job measurements as specified above but within 1/4 inch (6 mm) of the thickness shown. The thickness of the completed subbase course shall be determined by depth tests or sample holes taken at intervals so each test shall represent no more than 500 square yards or by survey.

**154-3.10 PROTECTION.** Work on subbase course shall not be conducted during freezing temperatures nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped. The Contractor shall protect and maintain the subgrade from yielding until the subbase is accepted.

**154-3.11 MAINTENANCE.** The Contractor shall maintain the completed course in a satisfactory condition until accepted by the Engineer.

## METHOD OF MEASUREMENT

**154-4.1** Subbase course shall be measured by the number of square yards (meters) of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon depth tests or cores taken as directed by the Engineer, at the rate of one (1) depth test for each 500 square yard (420 sq m) of subbase course or by means of average end areas on the complete work computed from elevations to the nearest 0.01 foot (3 mm). On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

## BASIS OF PAYMENT

**154-5.1** Payment shall be made at the contract unit price per square yard (meter) for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- Item P-154a Subbase Course (6-inches, Mixed in Place, Runway) - per square yard
- Item P-154b Subbase Course (6-inches, Mixed in Place, Taxiway) - per square yard
- Item P-154c Subbase Course (6-inches, Mixed in Place, Holding Bay) – per square yard
- Item P-154d Subbase Course (6-inches, Holding Bay) – per square yard

### TESTING REQUIREMENTS

- ASTM C117 Standard Test Method for Materials Finer Than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
- ASTM C136 Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
- ASTM D75 Standard Practice for Sampling Aggregates
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
- ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
- ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D4718 Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
- ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

### END OF ITEM P-154

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**ITEM P-156  
TEMPORARY AIR AND WATER POLLUTION,  
SOIL EROSION, AND SILTATION CONTROL**

**DESCRIPTION**

**156-1.1** This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be designed, installed, and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

Contractor will be required to complete and submit all required permits including, but not limited to, Air Quality Control Program: Activity Application to NNEPA Operating Permit Program and the Clean Water Act Section 402 Permit Application.

**MATERIALS**

**156-2.1 GRASS.** Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

**156-2.2 MULCHES.** Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per Item T-908. Mulches shall not create a wildlife attractant.

**156-2.3 FERTILIZER.** Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

**156-2.4 SLOPE DRAINS.** Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

**156-2.5 SILT FENCE.** The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461.

**156-2.6 OTHER.** All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project.

## CONSTRUCTION REQUIREMENTS

**156-3.1 GENERAL.** In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

**156-3.2 SCHEDULE.** Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

**156-3.3 CONSTRUCTION DETAILS.** The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

**156-3.4 INSTALLATION, MAINTENANCE AND REMOVAL OF SILT FENCES.** Silt fences shall extend a minimum of 16 inches (41 cm) and a maximum of 34 inches (86 cm) above the ground surface. Posts shall be set no more than 10 feet (3 m) on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch (300-mm) overlap and securely sealed. A trench shall be excavated approximately 4 inches (100 mm) deep by 4 inches (100 mm) wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

### **METHOD OF MEASUREMENT**

**156-4.1** Temporary erosion and pollution control work shall not be measured for payment.

a. Temporary benches, dikes, dams, and sediment basins will be paid for under this item and shall be incidental for excavation performed, including necessary cleaning of sediment basins, and the cubic yard (cubic meter) of embankment placed as directed by the Engineer.

**156-4.2** Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

### **BASIS OF PAYMENT**

**156-5.1** No direct payment shall be made for temporary air and water pollution, soil erosion, and siltation control.

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

### **MATERIAL REQUIREMENTS**

ASTM D6461                      Standard Specification for Silt Fence Materials

AC 150/5200-33                Hazardous Wildlife Attractants

### **END OF ITEM P-156**

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## ITEM P-208 AGGREGATE BASE COURSE

**208-1.1** This item shall consist of a base course composed of course aggregate bonded with fine aggregate base. It shall be constructed on a prepared subgrade or subbase course per these specifications and shall conform to the dimensions and typical cross-section shown on the plans.

### MATERIALS

**208-2.1 AGGREGATE BASE.** The aggregate base material shall consist of both fine and coarse aggregate. Material shall be clean, sound, durable particles and fragments of stone or gravel, crushed stone, or crushed gravel mixed or blended with sand, screenings, or other similar materials produced from approved sources. The aggregate shall be free from lumps of clay, organic matter, and other objectionable materials or coatings.

Crushed aggregate shall consist of clean, sound, durable stones and rock crushed to specified size and shall be free from excess soft or disintegrated pieces, dirt, or other objectionable matter. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as nearly constant and uniform as practicable.

The coarse aggregate portion, defined as the portion retained on the No. 4 sieve, shall not have a loss of greater than 50% when tested per ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. The aggregate shall have at least 60% by weight of particles with at least two fractured faces and 75% with at least one fractured face per ASTM D5821. The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. The aggregate shall contain no more than 15%, by weight, of flat, elongated, or flat and elongated particles per ASTM D4791. A flat particle is one having a ratio of width to thickness greater than three (3); an elongated particle is one having a ratio of length to width greater than three (3).

The fine aggregate portion, defined as the portion passing the No. 4 sieve, produced in crushing operations shall be incorporated in the base material to the extent permitted by the gradation requirements.

**a. Sampling and testing for initial aggregate base requirements.** Samples shall be taken by the Contractor in the presence of the Engineer. Material shall meet the requirements in paragraph 208-2.1 and 208-2.2. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

**208-2.2 GRADATION REQUIREMENT.** The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine as defined by ASTM D2487 and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa. The fraction of material passing the No. 200 (0.075 mm) sieve shall not exceed one-half the fraction passing the No. 40 (0.45 mm) sieve. The portion of the filler and binder, including any blended material, passing the No. 40 (0.45 mm) sieve shall have a liquid limit not more than 25 and a plasticity index not more than five (5) when tested per ASTM D4318.

The material finer than 0.02 mm shall be limited to a maximum of 3% and the maximum allowable material passing the No. 200 sieve shall be reduced from 0-8% to 0-5%. Testing per ASTM D422 will be required for the percentage passing the 0.02 mm particle size once per lot.

#### REQUIREMENTS FOR GRADATION OF AGGREGATE BASE

Sieve Size	Design Range Percentage by Weight	Contractor's Final Gradation	Job Control Grading Band Tolerances for Contractor's Final Gradation Percent
2 inch (50 mm)	--		0
1-1/2 inch (38 mm)	--		±5
1 inch (25 mm)	100		±8
3/4 inch (19 mm)	70-100		±8
No. 4 (4.75 mm)	35-65		±8
No. 40 (0.45 mm)	10-25		±5
No. 200 (0.075 mm)	5-15		±3

The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

**a. Sampling and testing for gradation.** The Contractor shall take at least two aggregate base samples per lot to check the final gradation. Sampling shall be per ASTM D75. The lot will be consistent with the lot size used for density. The samples shall be taken from the in-place, un-compacted material in the presence of the Engineer. Sampling points and intervals will be designated by the Engineer.

#### CONSTRUCTION METHODS

**208-3.1 OPERATIONS IN PITS AND QUARRIES.** All work involved in clearing and stripping pits and quarries, including handling of unsuitable material, shall be performed by the Contractor. All material shall be handled in a manner that shall secure a uniform and satisfactory base product. The base course material shall be obtained from sources that have been approved by the Engineer.

**208-3.2 PREPARING UNDERLYING SUBGRADE AND/OR SUBBASE.** The underlying subgrade and/or subbase shall be checked and accepted by the Engineer before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with P-152, at the Contractor's expense, may be required by the Engineer if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

**208-3.3 PRODUCTION.** The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 208-3.5, the approved material may be transported directly to the spreading equipment.

**208-3.4 PLACING.** The aggregate base material shall be placed and spread on the prepared underlying subgrade and/or subbase and compacted in layers to the thickness shown on the plans. Work shall progress without interruption. The material shall be deposited and spread in lanes in a uniform layer without segregation to such loose depth that, when compacted, the layer shall have the specified thickness. The aggregate base course shall be constructed in layers of uniform thickness of not less than 3 inches (75 mm) nor more than 6 inches (150 mm) of compacted thickness. The aggregate as spread shall be of uniform grading with no pockets of fine or coarse materials. The aggregate, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards (1700 sq m) in advance of the rolling. Any necessary sprinkling shall be kept within these limits. Care shall be taken to prevent cutting into the underlying layer during spreading. No material shall be placed in snow or on a soft, muddy, or frozen course. The aggregate base material shall be spread by spreader boxes or other approved devices. This equipment shall have positive thickness controls that spread the aggregate in the required amount to avoid or minimize the need for hand manipulation. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

When more than one layer is required, the construction procedure described here shall apply similarly to each layer.

**208-3.5 COMPACTION.** Immediately upon completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density. The moisture content of the material during placing operations shall be within  $\pm 2$  percentage points of the optimum moisture content as determined by ASTM D6938 using Procedure A, the direct transmission method.

**208-3.6 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY.** Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day's production if it does not exceed 2400 square yards (2000 sq m). A lot will consist of one-half day's production if a day's production is between 2400 and 4800 square yards (2000 and 4000 sq m). Engineer shall perform all acceptance density test.

Each lot shall be divided into two equal sublots. One test shall be made for each subplot and shall consist of the average of two random locations for density determination. Sampling locations will be determined by the Engineer on a random basis per ASTM D3665.

Each lot shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM D698. The in-place field density shall be determined per ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.

**208-3.7 SURFACE TOLERANCES.** After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and recompacted to grade until the required smoothness and accuracy are obtained and approved by the Engineer. Any deviation in surface tolerances shall be corrected

by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

**a. Smoothness.** The finished surface shall not vary more than 3/8-inch (9 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

**b. Accuracy.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +0 and -1/2 inch (12 mm) of the specified grade.

**208-3.8 THICKNESS CONTROL.** The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the Engineer. Tests shall be taken at intervals representing no more than 300 square yards (250 sq m) per test. Where the thickness is deficient by more than 1/2 inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

**208-3.9 PROTECTION.** Perform construction when the atmospheric temperature is above 35°F (2°C). When the temperature falls below 35°F (2°C), protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements. When the aggregates contain frozen materials or when the underlying course is frozen or wet, the construction shall be stopped. Hauling equipment may be routed over completed portions of the base course, provided no damage results. Equipment shall be routed over the full width of the base course to avoid rutting or uneven compaction. The Engineer will stop all hauling over completed or partially completed base course when, in the Engineer's opinion, such hauling is causing damage. Any damage to the base course shall be repaired by the Contractor at the Contractor's expense.

**208-3.10 MAINTENANCE.** The Contractor shall maintain the base course in a satisfactory condition until the full pavement section is completed and accepted by the Engineer. The surface shall be kept clean and free from foreign material and properly drained at all times. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any base course that is not paved over prior to the onset of winter shall be retested to verify that it still complies with the requirements of this specification. Any area of base course that is damaged shall be reworked or replaced as necessary to comply with this specification.

Equipment used in the construction of an adjoining section may be routed over completed base course, if no damage results and the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

**THE CONTRACTOR SHALL REMOVE ALL SURVEY AND GRADE HUBS FROM THE BASE COURSES PRIOR TO PLACING ANY BITUMINOUS SURFACE COURSE.**

**METHOD OF MEASUREMENT**

**208-4.1** The quantity of aggregate base course shall be measured by the number of square yards of material actually constructed and accepted by the Engineer as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

**BASIS OF PAYMENT**

**208-5.1** Payment shall be made at the contract unit price per square yards for aggregate base course. This price shall be full compensation for furnishing all materials and for all operations, hauling, placing, and compacting of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-208	Crushed Aggregate Base Course (6-inches) - per square yards
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**TESTING REQUIREMENTS**

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2700 kN-m/m <sup>3</sup> ))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

**END OF ITEM P-208**

**ITEM P-401  
HOT MIX ASPHALT (HMA) PAVEMENTS**

**DESCRIPTION**

**401-1.1** This item shall consist of pavement courses composed of mineral aggregate and asphalt cement binder (asphalt binder) mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

**MATERIALS**

**401-2.1 AGGREGATE.** Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. The portion retained on the No. 4 (4.75 mm) sieve is coarse aggregate. The portion passing the No. 4 (4.75 mm) sieve and retained on the No. 200 (0.075 mm) sieve is fine aggregate, and the portion passing the No. 200 (0.075 mm) sieve is mineral filler.

**a. Coarse aggregate.** Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the bituminous material and free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40% when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. Clay lumps and friable particles shall not exceed 1.0% when tested in accordance with ASTM C142.

Aggregate shall contain at least 50% by weight of individual pieces having two or more fractured faces and 65% by weight having at least one fractured face. The area of each face shall be equal to at least 75% of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The aggregate shall not contain more than a total of 8%, by weight, of flat particles, elongated particles, and flat and elongated particles, when tested in accordance with ASTM D4791 with a value of 5:1.

**b. Fine aggregate.** Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter.

The fine aggregate, including any blended material for the fine aggregate, shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

Clay lumps and friable particles shall not exceed 1.0%, by weight, when tested in accordance with ASTM C142.

Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 15% natural sand by weight of total aggregates. If used, the natural sand shall meet the requirements of ASTM D1073 and shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The aggregate shall have sand equivalent values of 45 or greater when tested in accordance with ASTM D2419.

**c. Sampling.** ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

**401-2.2 MINERAL FILLER.** If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

**401-2.3 ASPHALT CEMENT BINDER.** Asphalt cement binder shall conform to ASTM D6373 Performance Grade (PG) 70-22. A certificate of compliance from the manufacturer shall be included with the mix design submittal.

The supplier's certified test report with test data indicating grade certification for the asphalt binder shall be provided to the Engineer for each load at the time of delivery to the mix plant. A certified test report with test data indicating grade certification for the asphalt binder shall also be provided to the Engineer for any modification of the asphalt binder after delivery to the mix plant and before use in the HMA.

**401-2.4 PRELIMINARY MATERIAL ACCEPTANCE.** Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

**a. Coarse aggregate:**

- (1) Percent of wear
- (2) Soundness
- (3) Clay lumps and friable particles
- (4) Percent fractured faces
- (5) Flat and elongated particles

**b. Fine aggregate:**

- (1) Liquid limit and Plasticity index
- (2) Soundness
- (3) Clay lumps and friable particles

(4) Percent natural sand

(5) Sand equivalent

**c. Mineral filler.**

**d. Asphalt binder.** Test results for asphalt binder shall include temperature/viscosity charts for mixing and compaction temperatures.

The certifications shall show the appropriate ASTM tests for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

**401-2.5 ANTI-STRIPPING AGENT.** Any anti-stripping agent or additive if required shall be heat stable, shall not change the asphalt cement viscosity beyond specifications, shall contain no harmful ingredients, shall be added in recommended proportion by approved method, and shall be a material approved by the Department of Transportation of the State in which the project is located.

## COMPOSITION

**401-3.1 COMPOSITION OF MIXTURE.** The HMA mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

**401-3.2 JOB MIX FORMULA (JMF).** No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix-design and JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.4. The HMA shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. ASTM D6926 shall be used for preparation of specimens using the manually held and operated hammer for the mix design procedure. ASTM D6927 shall be used for testing for Marshall stability and flow.

If material variability exceeds the standard deviations indicated, the JMF and subsequent production targets shall be based on a stability greater than shown in Table 1 and the flow shall be targeted close to the mid-range of the criteria in order to meet the acceptance requirements.

The design criteria in Table 1 are target values necessary to meet the acceptance requirements contained in paragraph 401-5.2b. The criteria is based on a production process which has a material variability with the following standard deviations:

Stability = 270 lbs (1200 N)

Flow (0.01 inch (0.25 mm)) = 0.015 inches (.38 mm)

Air Voids = 0.65%.

Tensile strength ratio (TSR) of the composite mixture, as determined by ASTM D4867, shall not be less than 75 when tested at a saturation of 70-80% or an anti-stripping agent shall be added to the HMA, as necessary, to produce a TSR of not less than 75 when tested at a saturation of

70-80%. If an anti-strip agent is required, it shall be provided by the Contractor at no additional cost to the Owner.

The JMF shall be submitted in writing by the Contractor at least 10 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates currently being produced.

The submitted JMF shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

**a.** Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the job mix formula.

**b.** Percent of asphalt cement.

**c.** Asphalt performance grade and type of modifier if used.

**d.** Number of blows per side of molded specimen.

**e.** Laboratory mixing temperature.

**f.** Laboratory compaction temperature.

**g.** Temperature-viscosity relationship of the PG asphalt cement binder showing acceptable range of mixing and compaction temperatures; and for modified binders include supplier recommended mixing and compaction temperatures.

**h.** Plot of the combined gradation on a 0.45 power gradation curve.

**i.** Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content.

**j.** Specific Gravity and absorption of each aggregate.

**k.** Percent natural sand.

**l.** Percent fractured faces.

**m.** Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).

**n.** Tensile Strength Ratio (TSR).

**o.** Anti-strip agent (if required).

**p.** Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

The Contractor shall submit to the Engineer the results of verification testing of three (3) asphalt samples prepared at the optimum asphalt content. The average of the results of this testing shall indicate conformance with the JMF requirements specified in Tables 1 and 3.

When the project requires asphalt mixtures of differing aggregate gradations, a separate JMF and the results of JMF verification testing shall be submitted for each mix.

The JMF for each mixture shall be in effect until a modification is approved in writing by the Engineer. Should a change in sources of materials be made, a new JMF must be submitted within 15 days and approved by the Engineer in writing before the new material is used. After the initial production JMF has been approved by the Engineer and a new or modified JMF is required for whatever reason, the subsequent cost of the Engineer's approval of the new or modified JMF, including a new test strip when required by the engineer, will be borne by the Contractor. There will be no time extension given or considerations for extra costs associated with the stoppage of production paving or restart of production paving due to the time needed for the Engineer to approve the initial, new or modified JMF.

The Marshall Design Criteria applicable to the project shall meet the criteria specified in Table 1.

**TABLE 1  
MARSHALL DESIGN CRITERIA**

Test Property	Value
Number of blows	50
Stability, pounds (Newtons) minimum	1350 (6000)
Flow, 0.01 in. (0.25 mm)	10-18
Air voids (%)	3.5
Percent voids in mineral aggregate, minimum	See Table 2

**TABLE 2  
MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE (VMA)**

Aggregate (See Table 3)	Minimum VMA
Gradation 3	16%
Gradation 2	15%
Gradation 1	14%

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 3 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 3 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

**TABLE 3  
AGGREGATE - HMA PAVEMENTS**

<b>Sieve Size</b>	<b>Percentage by Weight Passing Sieve</b>
1 inch (25 mm)	--
3/4 inch (19 mm)	100
1/2 inch (12 mm)	79-99
3/8 inch (9 mm)	68-88
No. 4 (4.75 mm)	48-68
No. 8 (2.36 mm)	33-53
No. 16 (1.18 mm)	20-40
No. 30 (0.60 mm)	14-30
No. 50 (0.30 mm)	9-21
No. 100 (0.15 mm)	6-16
No. 200 (0.075 mm)	3-6
<b>Asphalt Percent:</b>	
Stone or gravel	5.0-7.5
Slag	6.5-9.5

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

**401-3.3 RECLAIMED ASPHALT PAVEMENT (RAP).** RAP shall not be used.

**401-3.4 JOB MIX FORMULA (JMF) LABORATORY.** The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

**401-3.5 TEST SECTION.** Prior to full production, the Contractor shall prepare and place a quantity of HMA according to the JMF. The amount of HMA shall be sufficient to construct a test section 300 feet long and 20 feet wide, placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. A cold joint for this test section is an exposed construction joint at least four (4) hours old or whose mat has cooled to less than 160°F (71°C). The cold joint must be cut back using the same procedure that will be used during production in accordance with 401-4.13. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

The test section shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 401-5.1 and 401-5.2. The test section shall be divided into equal sublots. As a minimum the test section shall consist of three (3) sublots.

The test section shall be considered acceptable if (1) stability, flow, mat density, air voids, and joint density are 90% or more within limits, (2) gradation and asphalt content are within the action limits specified in paragraphs 401-6.5a and 5b, and (3) the voids in the mineral aggregate are within the limits of Table 2.

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the Contractor's expense. Full production shall not begin until an acceptable test section has been constructed and accepted in writing by the Engineer. Once an acceptable test section has been placed, payment for the initial test section and the section that meets specification requirements shall be made in accordance with paragraph 401-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMF. If aggregates produced by the plant do not satisfy the gradation requirements or produce a mix that meets the JMF, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens shall be prepared and the optimum asphalt content determined in the same manner as for the original JMF tests.

Contractor will not be allowed to place the test section until the Contractor Quality Control Program, showing conformance with the requirements of Paragraph 401-6.1, has been approved, in writing, by the Engineer.

## CONSTRUCTION METHODS

**401-4.1 WEATHER LIMITATIONS.** The HMA shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

**TABLE 4**  
**SURFACE TEMPERATURE LIMITATIONS OF UNDERLYING COURSE**

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches (7.5 cm) or greater	40	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

**401-4.2 HMA PLANT.** Plants used for the preparation of HMA shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 with the following changes:

Requirements for all plants include:

**a. Truck scales.** The HMA shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as

often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of the General Provisions, subsection 90-01.

In lieu of scales, and as approved by the Engineer, HMA weight may be determined by the use of an electronic weighing system equipped with an automatic printer that weighs the total HMA production and as often thereafter as requested by the Engineer.

**b. Testing facilities.** The Contractor shall ensure laboratory facilities are provided at the plant for the use of the Engineer. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, calibrations, current reference standards to comply with the specifications and a masonry saw with diamond blade for trimming pavement cores and samples.

The plant testing laboratory shall have a floor space area of not less than 200 square feet (18.5 sq m), with a ceiling height of not less than 7-1/2 feet (2 m). The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot weather to maintain temperatures for testing purposes of 70°F ±5°F (21°C ±2.3°C). The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials. In addition, the facility shall include the minimum:

- (1) Adequate artificial lighting.
- (2) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.
- (3) A minimum of two (2) Underwriter's Laboratories approved fire extinguishers of the appropriate types and class.
- (4) Work benches for testing.
- (5) Desk with chairs and file cabinet.
- (6) Sanitary facilities convenient to testing laboratory.
- (7) Exhaust fan to outside air.
- (8) Sink with running water.

Failure to provide the specified facilities shall be sufficient cause for disapproving HMA plant operations.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

**c. Inspection of plant.** The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

**d. Storage bins and surge bins.** The HMA stored in storage and surge bins shall meet the same requirements as HMA loaded directly into trucks and may be permitted under the following conditions:

(1) Stored in non-insulated bins for a period of time not to exceed three (3) hours.

(2) Stored in insulated bins for a period of time not to exceed eight (8) hours.

If the Engineer determines that there is an excessive amount of heat loss, segregation, or oxidation of the HMA due to temporary storage, no temporary storage will be allowed.

**401-4.3 HAULING EQUIPMENT.** Trucks used for hauling HMA shall have tight, clean, and smooth metal beds. To prevent the HMA from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the Engineer. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

**401-4.3.1 MATERIAL TRANSFER VEHICLE (MTV).** Material transfer vehicles are not required.

**401-4.4 HMA PAVERS.** HMA pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of HMA that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the HMA uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

If, during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued and satisfactory equipment shall be provided by the Contractor.

**401-4.4.1 AUTOMATIC GRADE CONTROLS.** The HMA paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within  $\pm 0.1\%$ .

The controls shall be capable of working in conjunction with any of the following attachments:

- a. Ski-type device of not less than 30 feet (9 m) in length.
- b. Taut string-line (wire) set to grade.
- c. Short ski or shoe.
- d. Laser control.

**401-4.5 ROLLERS.** Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the HMA. The number, type, and weight of rollers shall be sufficient to compact the HMA to the required density while it is still in a workable condition.

All rollers shall be specifically designed and suitable for compacting HMA concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used. Depressions in pavement surfaces caused by rollers shall be repaired by the Contractor at their own expense.

The use of equipment that causes crushing of the aggregate will not be permitted.

**401-4.6. DENSITY DEVICE.** The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new HMA. These densities shall be supplied to the Engineer upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

**401-4.7 PREPARATION OF ASPHALT BINDER.** The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

**401-4.8 PREPARATION OF MINERAL AGGREGATE.** The aggregate for the HMA shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

**401-4.9 PREPARATION OF HMA.** The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the

percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all HMA upon discharge shall not exceed 0.5%.

**401-4.10 PREPARATION OF THE UNDERLYING SURFACE.** Immediately before placing the HMA, the underlying course shall be cleaned of all dust and debris. A prime coat or tack coat shall be applied in accordance with Item P-602 or P-603, if shown on the plans.

**401-4.11 LAYDOWN PLAN, TRANSPORTING, PLACING, AND FINISHING.** Prior to the placement of the HMA, the Contractor shall prepare a laydown plan for approval by the Engineer. This is to minimize the number of cold joints in the pavement. The laydown plan shall include the sequence of paving laydown by stations, width of lanes, temporary ramp locations, and laydown temperature. The laydown plan shall also include estimated time of completion for each portion of the work (that is, milling, paving, rolling, cooling, etc.). Modifications to the laydown plan shall be approved by the Engineer.

The HMA shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 401-4.3. Deliveries shall be scheduled so that placing and compacting of HMA is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose for the first lift of all runway and taxiway pavements. Successive lifts of HMA surface course may be placed using a ski, or laser control per paragraph 401-4.4.1, provided grades of the first lift of HMA surface course meet the tolerances of paragraphs 401-5.2b(6) as verified by a survey. Contractor shall survey each lift of HMA surface course and certify to Engineer that every lot of each lift meets the grade tolerances of paragraph 401-5.2b(6) before the next lift can be placed.

The initial placement and compaction of the HMA shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250°F (121°C).

Edges of existing HMA pavement abutting the new work shall be saw cut and carefully removed as shown on the drawings and coated with asphalt tack coat before new material is placed against it.

Upon arrival, the HMA shall be placed to the full width by a HMA paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the HMA mat. Unless otherwise permitted, placement of the HMA shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The HMA shall be placed in consecutive adjacent strips having a minimum width as specified in laydown plan except where edge lanes require less width to complete the area. Additional screed sections shall not be attached to widen paver to meet the minimum lane width requirements specified above unless additional auger sections are added to match. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot (30 cm); however, the joint in the surface top course shall be at the centerline of

crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m).

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the HMA may be spread and luted by hand tools.

Areas of segregation in the surface course, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of 2 inches (50 mm) deep. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

**401-4.12 COMPACTION OF HMA.** After placing, the HMA shall be thoroughly and uniformly compacted by power rollers. The surface shall be compacted as soon as possible when the HMA has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the HMA to the roller, the wheels shall be equipped with a scraper and kept properly moistened but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power driven tampers. Tampers shall weigh not less than 275 pounds (125 kg), have a tamping plate width not less than 15 inches (38 cm), be rated at not less than 4,200 vibrations per minute, and be suitably equipped with a standard tamping plate wetting device.

Any HMA that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

**401-4.13 JOINTS.** The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid HMA except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh HMA against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back 3 inches (75 mm) to 6 inches (150 mm) to expose a clean,

sound, uniform vertical surface for the full depth of the course. All cutback material shall be removed from the project. Asphalt tack coat or other product approved by the Engineer shall be applied to the clean, dry joint, prior to placing any additional fresh HMA against the joint. Any laitance produced from cutting joints shall be removed by vacuuming and washing. The cost of this work shall be considered incidental to the cost of the HMA.

**401-4.14 SAW-CUT GROOVING.** If shown on the plans, saw cut grooves shall be provided as specified in Item P-621.

**401-4.15 DIAMOND GRINDING.** When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch (3-mm) wide and there shall be a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet (0.9 m) wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. The depth of grinding shall not exceed 1/2 inch (13mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. Areas that have been ground will be sealed with a P-608 surface treatment as directed by the Engineer. It may be necessary to seal a larger area to avoid surface treatment creating any conflict with runway or taxiway markings.

**401-4.16 NIGHTTIME PAVING REQUIREMENTS.** Paving during nighttime construction shall require the following:

**a.** All paving machines, rollers, distribution trucks and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.

**b.** Minimum illumination level shall be twenty (20) horizontal foot-candles and maintained in the following areas:

**(1)** An area of 30 feet (9 m) wide by 30 feet (9 m) long immediately behind the paving machines during the operations of the machines.

**(2)** An area 15 feet (4.5 m) wide by 30 feet (9 m) long immediately in front and back of all rolling equipment, during operation of the equipment.

**(3)** An area 15 feet (4.5 m) wide by 15 feet (4.5 m) long at any point where an area is being tack coated prior to the placement of pavement.

**c.** As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.

**d.** A lighting plan must be submitted by the Contractor and approved by the Engineer prior to the start of any nighttime work.

## MATERIAL ACCEPTANCE

**401-5.1 ACCEPTANCE SAMPLING AND TESTING.** Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring and profilograph testing as required in this section shall be completed and paid for by the Contractor.

Testing organizations performing these tests except profilograph shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations at the Contractor's expense.

**a. Hot mixed asphalt.** Plant-produced HMA shall be tested for air voids, stability, and flow on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. Samples shall be taken in accordance with ASTM D979.

A standard lot shall be equal to one day's production or 2000 tons (1814 metric tons) whichever is smaller. If the day's production is expected to exceed 2000 tons (1814 metric tons), but less than 4000 tons (3628 metric tons), the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons (3628 metric tons), the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons (1814 metric tons).

Where more than one plant is simultaneously producing HMA for the job, the lot sizes shall apply separately for each plant.

**(1) Sampling.** Each lot will consist of four equal sublots. Sufficient HMA for preparation of test specimens for all testing will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D3665. Samples will be taken in accordance with ASTM D979.

The sample of HMA may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to stabilize to compaction temperature. The compaction temperature of the specimens shall be as specified in the JMF.

**(2) Testing.** Sample specimens shall be tested for stability and flow in accordance with ASTM D6927. Air voids will be determined by the Engineer in accordance with ASTM D3203. One set of laboratory compacted specimens will be prepared for each subplot in accordance with ASTM D6926 at the number of blows required by paragraph 401-3.2, Table 1. Each set of laboratory compacted specimens will consist of three test specimens prepared from the same sample. The manual hammer in ASTM D6926 shall be used.

Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D2726 using the procedure for laboratory-prepared thoroughly dry specimens for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured one time for each subplot in accordance with ASTM D2041. The value used in the air

voids computation for each subplot shall be based on theoretical maximum specific gravity measurement for the subplot.

The stability and flow for each subplot shall be computed by averaging the results of all test specimens representing that subplot.

**(3) Acceptance.** Acceptance of plant produced HMA for stability, flow, and air voids shall be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b.

**b. In-place HMA.** HMA placed in the field shall be tested for mat and joint density on a lot basis. A standard lot shall be equal to one day's production or 2000 tons (1814 metric tons) whichever is smaller. If the day's production is expected to exceed 2000 tons (1814 metric tons), but less than 4000 tons (3628 metric tons), the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons (3628 metric tons), the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons (1814 metric tons).

**(1) Mat density.** The lot size shall be the same as that indicated in paragraph 401-5.1a and shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint.

**(2) Joint density.** The lot size shall be the total length of longitudinal joints constructed by a lot of HMA as defined in paragraph 401-5.1a. The lot shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each subplot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. All cores for joint density shall be taken centered on the joint. The minimum core diameter for joint density determination shall be 5 inches (125 mm).

**(3) Sampling.** Samples shall be neatly cut with a diamond core drill bit. Samples will be taken in accordance with ASTM D979. The minimum diameter of the sample shall be 5 inches (125 mm). Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for cutting samples, cleaning, and filling the cored pavement. Cored pavement shall be cleaned and core holes shall be filled in a manner acceptable to the Engineer and within one day after sampling. Laitance produced by the coring operation shall be removed immediately.

The top most lift of HMA shall be completely bonded to the underlying layer. If any of the cores reveal that the surface is not bonded to the layer immediately below the surface then additional cores shall be taken as directed by the Engineer in accordance with paragraph 401-5.1b to determine the extent of any delamination. All delaminated areas shall be completely removed by milling to the limits and depth and replaced as directed by the Engineer at no additional cost.

**(4) Testing.** The bulk specific gravity of each cored sample will be measured by the Engineer in accordance with ASTM D2726. Samples will be taken in accordance with ASTM D979. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot, as determined in paragraph 401-5.1a(2). The bulk specific gravity

used to determine the joint density at joints formed between different lots shall be the lowest of the bulk specific gravity values from the two different lots.

**(5) Acceptance.** Acceptance of field placed HMA for mat density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(1). Acceptance for joint density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(3).

**c. Partial lots.** When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular subplot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, that is,  $n = 5$  or  $n = 6$ , for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, that is,  $n = 3$ .

#### **401-5.2 ACCEPTANCE CRITERIA.**

**a. General.** Acceptance will be based on the following characteristics of the HMA and completed pavement as well as the implementation of the Contractor Quality Control Program and test results:

- (1)** Air voids
- (2)** Mat density
- (3)** Joint density
- (4)** Thickness
- (5)** Smoothness
- (6)** Grade
- (7)** Stability
- (8)** Flow

Mat density and air voids will be evaluated for acceptance in accordance with paragraph 401-5.2b(1). Stability and flow will be evaluated for acceptance in accordance with paragraph 401-5.2b(2). Joint density will be evaluated for acceptance in accordance with paragraph 401-5.2b(3).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 401-5.2b(4). Acceptance for smoothness will be based on the criteria contained in paragraph 401-5.2b(5). Acceptance for grade will be based on the criteria contained in paragraph 401-5.2b(7).

The Engineer may at any time, reject and require the Contractor to dispose of any batch of HMA which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

#### **b. Acceptance criteria.**

**(1) Mat density and air voids.** Acceptance of each lot of plant produced material for mat density and air voids shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment shall be determined in accordance with paragraph 401-8.1.

**(2) Stability and flow.** Acceptance of each lot of plant produced HMA for stability and flow shall be based on the PWL. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. If the PWL is less than 90%, the Contractor shall determine the reason and take corrective action. If the PWL is below 80%, the Contractor must stop production until the reason for poor stability and/or flow has been determined and adjustments to the HMA are made.

**(3) Joint density.** Acceptance of each lot of plant produced HMA for joint density shall be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot shall be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint shall be reduced by five (5) percentage points. This lot pay factor reduction shall be incorporated and evaluated in accordance with paragraph 401-8.1.

**(4) Thickness.** Thickness of each lift of surface course shall be evaluated by the Engineer for compliance to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point shall not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, shall not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the Engineer to circumscribe the deficient area.

**(5) Smoothness.** The final surface shall be free from roller marks. After the final rolling, but not later than 24 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each pavement lot having an average profile index meeting the requirements of paragraph 401-8.1d when evaluated with a profilograph; and the finished surface course of the pavement shall not vary more than 1/4 inch (6mm) when evaluated with a 12-foot (3.7m) straightedge. When the surface course smoothness exceeds specification tolerances

which cannot be corrected by diamond grinding of the surface course, full depth removal and replacement of surface course corrections shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified. The Contractor shall apply a surface treatment per Item P-608 or P-609 to all areas that have been subject to grinding as directed by the Engineer.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet (15m) or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. High spots on final surface course > 1/4 inch (6mm) in transverse direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet (15m) or more often if directed by the Engineer. Deviations on final surface course > 1/4 inch (6mm) in transverse direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6m) or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet (60m) and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet (4.5m) of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4-inch (6mm) when evaluated with a 12-foot (3.7m) straightedge. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be

determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course > 1/4 inch (6mm) in longitudinal direction will be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) Profilograph Testing. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate “must grind” bumps and the Profile Index for the pavement using a 0.2 inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.

The pavement must have an average profile index meeting the requirements of paragraph 401-8.1d. High spots, or “must grind” spots, on final surface course in longitudinal direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches (38 cm) per mile or less. If the initial average profile index was less than 15 inches (38 cm), only those areas representing greater than 0.4 inch (10 mm) deviation will be re-profiled for correction verification.

(iii) Final profilograph of runway. Final profilograph, full length of runway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 401-8.1d. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate “must grind” bumps and the Profile Index for the pavement using a 0.2 inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final runway shall be performed one foot right and left of runway centerline and 15 feet (4.5 m) right and left of centerline. Any areas that indicate “must grind” will be corrected as directed by the Engineer.

Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 24 hours of placement of material. Smoothness testing indicated in paragraph (iii) shall be performed within 48 hours of paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective

actions then production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.

**(6) Grade.** Grade shall be evaluated on the first day of placement and then as a minimum, once daily to allow adjustments to paving operations if measurements do not meet specification requirements. The Contractor must submit the survey data to the Engineer by the following day after measurements have been taken. The finished surface of the pavement shall not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm). The finished grade of each lot will be determined by running levels at intervals of 50 feet (15 m) or less longitudinally and all breaks in grade transversely (not to exceed 50 feet (15 m)) to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer. The lot size shall be 2,000 square yards ( $m^2$ ). When more than 15% of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates 3/4 inch (19 mm) or more from planned grade, the Contractor shall remove the deficient area to the depth of the final course plus 1/2 inch (12 mm) of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off provided the course thickness complies with the thickness specified on the plans. The surface of the ground pavement shall have a texture consisting of grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide. The peaks and ridges shall be approximately 1/32 inch (1 mm) higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 square yards ( $12.5 m^2$ ). Areas in excess of 15 square yards ( $12.5 m^2$ ) will require removal and replacement of the pavement in accordance with the limitations noted above. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

**c. Percentage of material within specification limits (PWL).** The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

**TABLE 5.  
MARSHALL ACCEPTANCE LIMITS FOR STABILITY, FLOW, AIR VOIDS, DENSITY**

TEST PROPERTY	Pavements Designed for Aircraft Gross Weights Less Than 60,000 lbs (27216 kg) or Tire Pressures Less Than 100 psi	
	50 blows	
	Specification Tolerance Limits	
	L	U
Stability, minimum (lbs)	1000	--
Flow, 0.01-in	8	20
Air Voids Total Mix (%)	2	5
Surface Course Mat Density (%)	96.3	101.3
Base Course Mat Density (%)	95.5	101.3
Joint density (%)	93.3	--

**d. Outliers.** All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the PWL shall be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 2.1.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 98% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 97.5% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 96% with 2.1% or less variability.

#### **401-5.3 RESAMPLING PAVEMENT FOR MAT DENSITY.**

**a. General.** Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2b(1). Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

**b. Payment for resampled lots.** The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

**c. Outliers.** Check for outliers in accordance with ASTM E178, at a significance level of 5%.

## CONTRACTOR QUALITY CONTROL

**401-6.1 GENERAL.** The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that affect the quality of the pavement including, but not limited to:

- a. Mix design
- b. Aggregate grading
- c. Quality of materials
- d. Stockpile management
- e. Proportioning
- f. Mixing and transportation
- g. Placing and finishing
- h. Joints
- i. Compaction
- j. Surface smoothness
- k. Personnel
- l. Laydown plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 401-6.3 and Section 100 of the General Provisions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

**401-6.2 CONTRACTOR TESTING LABORATORY.** The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications.

**401-6.3 QUALITY CONTROL TESTING.** The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

**a. Asphalt content.** A minimum of two asphalt content tests shall be performed per lot in accordance with ASTM D6307 or ASTM D2172 if the correction factor in ASTM D6307 is greater than 1.0. The asphalt content for the lot will be determined by averaging the test results.

**b. Gradation.** Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

**c. Moisture content of aggregate.** The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

**d. Moisture content of HMA.** The moisture content shall be determined once per lot in accordance with ASTM D1461.

**e. Temperatures.** Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the HMA at the plant, and the HMA at the job site.

**f. In-place density monitoring.** The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

**g. Additional testing.** Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

**h. Monitoring.** The Engineer reserves the right to monitor any or all of the above testing.

**401-6.4 SAMPLING.** When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

**401-6.5 CONTROL CHARTS.** The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each subplot will be calculated and monitored by the Quality Control laboratory.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

**a. Individual measurements.** Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

CONTROL CHART LIMITS FOR INDIVIDUAL MEASUREMENTS		
Sieve	Action Limit	Suspension Limit
3/4 inch (19 mm)	±6%	±9%
1/2 inch (12 mm)	±6%	±9%
3/8 inch (9 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (0.30 mm)	±3%	±4.5%
No. 200 (0.075 mm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
VMA	-1.00%	-1.50%

**b. Range.** Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of  $n = 2$ . Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for  $n = 3$  and by 1.27 for  $n = 4$ .

CONTROL CHART LIMITS BASED ON RANGE (BASED ON N = 2)	
Sieve	Suspension Limit
1/2 inch (12 mm)	11%
3/8 inch (9 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (0.30 mm)	6%
No. 200 (0.075 mm)	3.5%
Asphalt Content	0.8%

**c. Corrective Action.** The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range;  
or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

**401-6.6 QUALITY CONTROL REPORTS.** The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in General Provisions, Section 100.

## METHOD OF MEASUREMENT

**401-7.1 MEASUREMENT.** HMA shall be measured by the number of tons (kg) of HMA used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

## BASIS OF PAYMENT

**401-8.1 PAYMENT.** Payment for a lot of HMA meeting all acceptance criteria as specified in paragraph 401-5.2 shall be made based on results of tests for smoothness, mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1a for mat density and air voids and 401-8.1c for smoothness, subject to the limitation that:

**a.** The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons (kg) of HMA used in the accepted work (See Note 1 under Table 6).

**b.** The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**c. Basis of adjusted payment.** The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71 percent, then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1. Payment in excess of 100% for accepted lots of HMA shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100%.

**TABLE 6**  
**PRICE ADJUSTMENT SCHEDULE<sup>1</sup>**

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject <sup>2</sup>

<sup>1</sup> Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1.

<sup>2</sup> The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

**d. Profilograph smoothness.** When the final average profile index (subsequent to any required corrective action) does not exceed 7 inches per mile (18 cm per 1.6 km), payment will be made at the contract unit price for the completed pavement. If the final average profile index (subsequent to any required corrective action) exceeds 7 inches per mile (18 cm per 1.6 km), but does not exceed 15 inches per mile (38 cm per 1.6 m), the Contractor may elect to accept a contract unit price adjustment in lieu of reducing the profile index.

**e. Basis of adjusted payment for smoothness.** Price adjustment for pavement smoothness will be made in accordance with Table 7. The adjustment will apply to the total tonnage of HMA within a lot of pavement and shall be applied with the following equation:

(Tons of asphalt concrete in lot) × (lot pay factor) × (unit price per ton) × (smoothness pay factor) = payment for lot

**TABLE 7  
PROFILOGRAPH AVERAGE PROFILE INDEX SMOOTHNESS PAY FACTOR**

Inches/miles per 1/10 mile	Short Sections	Pay Factor
0.0 - 7	00.0 - 15.0	100%
7.1 - 9	15.1 - 16	98%
9.1 - 11	16.1 - 17	96%
11.1 - 13	17.1 - 18	94%
13.1 - 14	18.1 - 20	92%
14.1 - 15	20.1 - 22	90%
15.1 and up	22.1 and up	Corrective work required <sup>1</sup>

<sup>1</sup> The Contractor shall correct pavement areas not meeting these tolerances by removing and replacing the defective work. If the Contractor elects to construct an overlay to correct deficiencies, the minimum thickness of the overlay should be at least three times the maximum aggregate size (approximately four (4) times the nominal maximum aggregate size). The corrective overlay shall not violate grade Criteria and butt joints shall be constructed by sawing and removing the original pavement in compliance with the thickness/ maximum aggregate size ratio. Skin patching shall not be permitted.

HMA placed above the specified grade shall not be included in the quantities for payment.

**401-8.1.1. Payment.** Payment will be made under:

Item P-401a              Bituminous Surface Course (4-inches, 50 blow) - per ton (kg)  
Item P-401b              Bituminous Material (PG 70-22) – per ton

**TESTING REQUIREMENTS**

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous mixtures
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
AASHTO T030	Standard Method of Test for Mechanical Analysis of Extracted Aggregate
AASHTO T110	Standard Method of Test for Moisture or Volatile Distillates in Hot Mix Asphalt (HMA)
AASHTO T275	Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Paraffin-Coated Specimens
AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

AASHTO T329      Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA)  
by Oven Method

Asphalt Institute Handbook MS-26, Asphalt Binder

Asphalt Institute MS-2Mix Design Manual, 7th Edition

### **MATERIAL REQUIREMENTS**

ASTM D242      Standard Specification for Mineral Filler for Bituminous Paving Mixtures

ASTM D946      Standard Specification for Penetration-Graded Asphalt Cement for Use in  
Pavement Construction

ASTM D3381      Standard Specification for Viscosity-Graded Asphalt Cement for Use in  
Pavement Construction

ASTM D4552      Standard Practice for Classifying Hot-Mix Recycling Agents

ASTM D6373      Standard Specification for Performance Graded Asphalt Binder

**END OF ITEM P-401**

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## ITEM P-602 BITUMINOUS PRIME COAT

### DESCRIPTION

**602-1.1** This item shall consist of an application of bituminous material on the prepared base course in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

### MATERIALS

**602-2.1 BITUMINOUS MATERIAL.** The bituminous material shall be an emulsified asphalt indicated in ASTM D3628 as a bituminous application for prime coat appropriate to local conditions or as designated by the Engineer.

### CONSTRUCTION METHODS

**602-3.1 WEATHER LIMITATIONS.** The prime coat shall be applied only when the existing surface is dry; the atmospheric temperature is 50°F (10°C) or above, and the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the Engineer.

**602-3.2 EQUIPMENT.** The equipment shall include a self-powered pressure bituminous material distributor and equipment for heating bituminous material.

Provide a distributor with pneumatic tires of such size and number that the load produced on the base surface does not exceed 65.0 psi (4.5 kg/sq cm) of tire width to prevent rutting, shoving or otherwise damaging the base, surface or other layers in the pavement structure. Design and equip the distributor to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard (0.23 to 9.05 L/square meter), with a pressure range of 25 to 75 psi (172.4 to 517.1 kPa) and with an allowable variation from the specified rate of not more than  $\pm 5\%$ , and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. Equip the distributor to circulate and agitate the bituminous material during the heating process. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the Owner.

A power broom and power blower suitable for cleaning the surfaces to which the bituminous coat is to be applied shall be provided.

**602-3.3 APPLICATION OF BITUMINOUS MATERIAL.** Immediately before applying the prime coat, the full width of the surface to be primed shall be swept with a power broom to remove all loose dirt and other objectionable material.

The bituminous material shall be uniformly applied with a bituminous distributor at the rate of 0.15 to 0.30 gallons per square yard (0.68 to 1.36 liters per square meter) depending on the base

course surface texture. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

Following application of the bituminous material and prior to application of the succeeding layer of pavement, allow the bituminous coat to cure and to obtain evaporation of any volatiles or moisture. Maintain the coated surface until the succeeding layer of pavement is placed, by protecting the surface against damage and by repairing and recoating deficient areas. Allow the prime coat to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course. Furnish and spread enough sand to effectively blot up and cure excess bituminous material. Keep traffic off surfaces freshly treated with bituminous material. Provide sufficient warning signs and barricades so that traffic will not travel over freshly treated surfaces.

**602-3.4 TRIAL APPLICATIONS.** Before providing the complete bituminous coat, the Contractor shall apply three lengths of at least 100 feet (30 m) for the full width of the distributor bar to evaluate the amount of bituminous material that can be satisfactorily applied with the equipment. Apply three different trial application rates of bituminous materials within the application range specified in paragraph 602-3.3. Other trial applications will be made using various amounts of material as deemed necessary by the Engineer.

**602-3.5 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY.** The Contractor shall provide a statement of source and character of the proposed bituminous material which must be submitted to and approved by the Engineer before any shipment of bituminous materials to the project. The Contractor shall furnish vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The test reports shall be provided to and approved by the Engineer before the bituminous material is applied. If the bituminous material does not meet the specifications, it shall be replaced at the Contractor's expense. Furnishing the vendor's certified test report for the bituminous material shall not be interpreted as basis for final acceptance.

**602-3.6 FREIGHT AND WEIGH BILLS.** The Contractor shall submit waybills and delivery tickets during the progress of the work. Before the final estimate is allowed, file with the Engineer certified waybills and certified delivery tickets for all bituminous materials used in the construction of the pavement covered by the contract. Do not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

## METHOD OF MEASUREMENT

**602-4.1** The bituminous material for prime coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The bituminous material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of bituminous material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the bituminous material is necessary. Water added to emulsified asphalt will not be measured for payment.

## BASIS OF PAYMENT

**602-5.1** Payment shall be made at the contract unit price per gallon for bituminous prime coat. This price shall be full compensation for furnishing all materials and for all preparation, delivering,

and applying the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P-602                      Bituminous Prime Coat - per gallon

**TESTING REQUIREMENTS**

ASTM D1250                      Standard Guide for Use of the Petroleum Measurement Tables

**MATERIAL REQUIREMENTS**

ASTM D977                      Standard Specification for Emulsified Asphalt

ASTM D2028                      Standard Specification for Cutback Asphalt (Rapid-Curing Type)

ASTM D2397                      Standard Specification for Cationic Emulsified Asphalt

ASTM D3628                      Standard Practice for Selection and Use of Emulsified Asphalts

**END OF ITEM P-602**

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## ITEM P-603 BITUMINOUS TACK COAT

### DESCRIPTION

**603-1.1** This item shall consist of preparing and treating a bituminous or concrete surface with bituminous material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

### MATERIALS

**603-2.1 BITUMINOUS MATERIALS.** The bituminous material shall be an emulsified asphalt indicated in ASTM D3628 as a bituminous application for tack coat appropriate to local conditions or as designated by the Engineer.

### CONSTRUCTION METHODS

**603-3.1 WEATHER LIMITATIONS.** The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F (10°C) or above; the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the Engineer.

**603-3.2 EQUIPMENT.** The Contractor shall provide equipment for heating and applying the bituminous material.

Provide a distributor with pneumatic tires of such size and number that the load produced on the base surface does not exceed 65.0 psi (4.5 kg/sq cm) of tire width to prevent rutting, shoving or otherwise damaging the base, surface or other layers in the pavement structure. Design and equip the distributor to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard (0.23 to 9.05 L/square meter), with a pressure range of 25 to 75 psi (172.4 to 517.1 kPa) and with an allowable variation from the specified rate of not more than  $\pm 5\%$ , and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. Equip the distributor to circulate and agitate the bituminous material during the heating process. If the distributor is not equipped with an operable quick shutoff valve, the tack operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the Owner.

A power broom and/or power blower suitable for cleaning the surfaces to which the bituminous tack coat is to be applied shall be provided.

**603-3.3 APPLICATION OF BITUMINOUS MATERIAL.** Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

Emulsified asphalt shall be diluted by the addition of water when directed by the Engineer and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before the overlying mixture is placed on the tacked surface.

The bituminous material including vehicle shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.10 gallons per square yard (0.20 to 0.50 liters per square meter) depending on the condition of the existing surface. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the Engineer. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed.

**603-3.4 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY.** The Contractor shall provide a statement of source and character of the proposed bituminous material which must be submitted and approved by the Engineer before any shipment of bituminous materials to the project.

The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The tests reports shall be provided to and approved by the Engineer before the bituminous material is applied. If the bituminous material does not meet the specifications, it shall be replaced at the Contractor's expense. Furnishing the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance.

**603-3.5 FREIGHT AND WEIGH BILLS.** The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the Engineer certified waybills and certified delivery tickets for all bituminous materials used in the construction of the pavement covered by the contract. Do not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

### **METHOD OF MEASUREMENT**

**603-4.1** The bituminous material for tack coat shall not be measured.

### **BASIS OF PAYMENT**

**603.5-1** No payment shall be made for bituminous tack coat material.

### **MATERIAL REQUIREMENTS**

ASTM D633	Standard Volume Correction Table for Road Tar
ASTM D977	Standard Specification for Emulsified Asphalt
ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2028	Standard Specification for Cutback Asphalt (Rapid-Curing Type)

ASTM D2397 Standard Specification for Cationic Emulsified Asphalt

ASTM D3628 Standard Practice for Selection and Use of Emulsified Asphalts

**END ITEM P-603**

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**ITEM P-610**  
**STRUCTURAL PORTLAND CEMENT CONCRETE**

**DESCRIPTION**

**610-1.1** This item shall consist of plain and reinforced structural portland cement concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. This specification shall be used for all structural and miscellaneous concrete including signage bases.

**MATERIALS**

**610-2.1 GENERAL.** Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

**a. Reactivity.** Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

**(1)** Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

**(2)** Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) CRD C662. If lithium nitrate admixture is used, it shall be nominal 30%  $\pm$ 0.5% weight lithium nitrate in water.

**(3)** If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

**610-2.2 COARSE AGGREGATE.** The coarse aggregate for concrete shall meet the requirements of ASTM C33. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet the following gradation shown in the table below when tested per ASTM C136.

**GRADATION FOR COARSE AGGREGATE**

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
	-
No. 4 to 3/4 in. (4.75-19 mm)	90-100
No. 4 to 1 in. (4.75-25 mm)	-
No. 4 to 1-1/2 in. (4.75-38 mm)	35-70

**610-2.2.1 AGGREGATE SUSCEPTIBILITY TO DURABILITY (D) CRACKING.** Coarse aggregate may be accepted from sources that have a 20-year service history for the same gradation to be supplied with no durability issues.

a. Material currently being produced shall have a durability factor  $\geq 95$  using ASTM C666. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable with concurrence of the FAA.

b. The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

**610-2.3 FINE AGGREGATE.** The fine aggregate for concrete shall meet the requirements of ASTM C33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of the table below when tested in accordance with ASTM C136:

**GRADATION FOR FINE AGGREGATE**

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8 inch (9 mm)	100
No. 4 (4.75 mm)	95-100
No. 16 (1.18 mm)	45-80
No. 30 (0.60 mm)	25-55
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

Blending will be permitted, if necessary, to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, if the deficiency does not exceed 5% and is remedied by the addition of pozzolanic or

cementitious materials other than Portland cement, as specified in paragraph 610-2.6, Admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

**610-2.4 CEMENT.** Cement shall conform to the requirements of ASTM C150 Type II.

If aggregates are deemed innocuous when tested in accordance with paragraph 610-2.1.a.1 and accepted in accordance with paragraph 610-2.1.a.3, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before use of the cement is granted. All test reports shall be subject to verification by testing sample materials received for use on the project.

**610-2.5 WATER.** The water used in concrete shall be fresh, clean and potable; free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances deleterious to concrete.

**610-2.6 ADMIXTURES AND SUPPLEMENTARY CEMENTITIOUS MATERIAL.** The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

**a. Air-entraining admixtures.** Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

**b. Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

**c. Other chemical admixtures.** The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

**d. Fly ash.** Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13%.

**610-2.7 PREMOLDED JOINT MATERIAL.** Premolded joint material for expansion joints shall meet the requirements of ASTM D1752.

**610-2.8 JOINT FILLER.** The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

**610-2.9 STEEL REINFORCEMENT.** Reinforcing shall consist of reinforcing steel conforming to the requirements of ASTM A615.

**610-2.10 MATERIALS FOR CURING CONCRETE.** Curing materials shall conform to one of the following:

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

## CONSTRUCTION METHODS

**610-3.1 GENERAL.** The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

**610-3.2 CONCRETE COMPOSITION.** The concrete shall develop a compressive strength of 4,000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cement per cubic yard (280 kg per cubic meter). The concrete shall contain 5% of entrained air,  $\pm 1\%$ , as determined by ASTM C231 and shall have a slump of not more than 4 inches (100 mm) as determined by ASTM C143.

**610-3.3 ACCEPTANCE SAMPLING AND TESTING.** Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The concrete shall be sampled in accordance with ASTM C172. Concrete cylindrical compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39. The Contractor shall cure and store the test specimens under such conditions as directed by the Engineer. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

**610-3.4 QUALIFICATIONS FOR CONCRETE TESTING SERVICE.** Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM C1077 or ASTM E329.

**610-3.5 PROPORTIONING AND MEASURING DEVICES.** When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so the required, exact weight of aggregates is obtained.

**610-3.6 CONSISTENCY.** The consistency of the concrete shall be determined by the slump test specified in ASTM C143.

**610-3.7 MIXING.** Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.

**610-3.8 MIXING CONDITIONS.** The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

**610-3.9 FORMS.** Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface. The forms shall not be removed until at least 30 hours after concrete placement for vertical faces, walls, slender columns, and similar structures. Forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate the concrete has developed at least 60% of the design strength.

**610-3.10 PLACING REINFORCEMENT.** All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

**610-3.11 EMBEDDED ITEMS.** Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

**610-3.12 PLACING CONCRETE.** All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the Engineer. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet (1.5 m). Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

**610-3.13 VIBRATION.** Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309, Guide for Consolidation of Concrete. Where bars meeting ASTM A775 or A934 are used, the vibrators shall be equipped with rubber or non-metallic vibrator heads. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches (100 mm) in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches (100 mm) or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 cycles per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any point shall be of sufficient duration to accomplish compaction but shall not be prolonged to where segregation occurs. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie or other approved method and shall not be disturbed after placement.

**610-3.14 CONSTRUCTION JOINTS.** If the placement of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, provisions shall be made for grooves, steps, reinforcing bars or other devices as specified. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

**610-3.15 EXPANSION JOINTS.** Expansion joints shall be constructed at such points and dimensions as indicated on the drawings. The premolded filler shall be cut to the same shape as the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place so that it will not be displaced when concrete is deposited against it.

**610-3.16 DEFECTIVE WORK.** Any defective work discovered after the forms have been removed, which in the opinion of the Engineer cannot be repaired satisfactorily, shall be immediately removed and replaced at the expense of the Contractor. Defective work shall include deficient dimensions, or bulged, uneven, or honeycomb on the surface of the concrete.

**610-3.17 SURFACE FINISH.** All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

The surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a finishing machine.

**610-3.18 CURING AND PROTECTION.** All concrete shall be properly cured and protected by the Contractor. The concrete shall be protected from the weather, flowing water, and from defacement

of any nature during the project. The concrete shall be cured by covering with an approved material as soon as it has sufficiently hardened. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for at least three (3) days following concrete placement. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Wooden forms shall be kept wet at all times until removed to prevent opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for seven (7) days after the concrete has been placed.

**610-3.19 DRAINS OR DUCTS.** Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

**610-3.20 COLD WEATHER PLACING.** When concrete is placed at temperatures below 40°F (4°C), the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated to place the concrete at temperatures between 50°F and 100°F (10°C and 38°C).

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than pounds (908 grams) of Type 1 nor more than 1.6 pounds (726 grams) of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas, framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50°F (10°C) until at least 60% of the designed strength has been attained.

**610-3.21 HOT WEATHER PLACING.** Concrete shall be properly placed and finished with procedures previously submitted. The concrete-placing temperature shall not exceed 90°F when measured in accordance with ASTM C1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph 610-2.6 may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120°F (50°C). Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature. Submit the proposed materials and methods for review and approval by the Engineer, if concrete is to be placed under hot weather conditions.

**610-3.22 FILLING JOINTS.** All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not start until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be done with proper equipment to obtain a neat looking joint free from excess filler.

## METHOD OF MEASUREMENT

**610-4.1** Portland cement concrete shall not be measured for payment.

## BASIS OF PAYMENT

**610-5.1** No direct payment shall be made for structural Portland cement concrete. The costs for furnishing all materials and for all preparation, delivery, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item shall be incidental to the bid items requiring concrete.

### TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar-Bar Method)
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662	Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

### MATERIAL REQUIREMENTS

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
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ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ACI 305R	Hot Weather Concreting

ACI 306R	Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

**END OF ITEM P-610**

## ITEM P-620 RUNWAY AND TAXIWAY MARKING

### DESCRIPTION

**620-1.1** This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

### MATERIALS

**620-2.1 MATERIALS ACCEPTANCE.** The Contractor shall furnish manufacturer’s certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

**620-2.2 MARKING MATERIALS.** Paint shall be waterborne or solvent-base in accordance with the requirements of paragraph 620-2.2. Paint shall be furnished in White – 37925, Red – 31136, Yellow - 33538 or 33655, and Black – 37038 in accordance with Federal Standard No. 595.

**a. Waterborne.** Paint shall meet the requirements of Federal Specification TT-P-1952E, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

**b. Solvent-Base.** Paint shall meet the requirements of Commercial Item Description A-A-2886B, Type II.

**620-2.3 REFLECTIVE MEDIA.** Glass beads shall meet the requirements for TT-B-1325D, Type I, Gradation A. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

### CONSTRUCTION METHODS

**620-3.1 WEATHER LIMITATIONS.** The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F (7°C) and rising and the pavement surface temperature is at least 5°F (2.7°C) above the dew point or meets the manufacturer’s recommendations. Painting operations shall be discontinued when the surface temperature exceeds the manufacturer’s recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

**620-3.2 EQUIPMENT.** Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

**620-3.3 PREPARATION OF SURFACE.** Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by sweeping or blowing or by other methods as required to remove all contaminants minimizing damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Prior to the application of any markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

**620-3.4 LAYOUT OF MARKINGS.** The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

**620-3.5 APPLICATION.** Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the Engineer. The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of 24-hours shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

The Contractor shall apply the paint in a two-part process. The temporary paint coat shall be applied as soon as possible after paving or asphalt maintenance. The final paint coat shall be applied 21 days following the temporary paint coat.

**620-3.6 TEST STRIP.** Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons (4 liters) of paint and application of 35 lbs (15.9 kg) of Type I/50 lbs (22.7 kg) of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons (19 liters) of waterborne paint shall cover no more than 575 square feet (53.4 m<sup>2</sup>).

**TABLE 1.**  
**APPLICATION RATES FOR PAINT AND GLASS BEADS**  
(See Note regarding Red and Pink Paint)

Paint Type	Paint Square feet per gallon, ft <sup>2</sup> /gal (Sq m per liter, m <sup>2</sup> /l)	Glass Beads, Type I, Gradation A Pounds per gallon of paint-lb/gal (Kg per liter of paint-kg/l)
Waterborne Type II	115 ft <sup>2</sup> /gal max (2.8 m <sup>2</sup> /l)	7 lb/gal min (0.85 kg/l)
Solvent Base	115 ft <sup>2</sup> /gal max (2.8 m <sup>2</sup> /l)	7 lb/gal min (0.85 kg/l)

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

### **620-3.7 APPLICATION – PREFORMED THERMOPLASTIC AIRPORT PAVEMENT MARKINGS. (DELETED)**

**620-3.8 PROTECTION AND CLEANUP.** After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

### **METHOD OF MEASUREMENT**

**620-4.1** The quantity of runway and taxiway markings to be paid for shall be the number of square feet (square meters) of painting and the number of pounds (kg) of reflective media performed in accordance with the specifications and accepted by the Engineer.

### BASIS OF PAYMENT

**620-5.1** Payment shall be made at the respective contract price per square foot (square meter) for runway and taxiway painting and price per pound (kg) for reflective media. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620a	Runway and Taxiway Markings - per square foot
Item P-620b	Reflective Media, Type I, Gradation A - per pound

### TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

### MATERIAL REQUIREMENTS

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
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40 CFR Part 60, Appendix A-7, Method 24

Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

FED SPEC TT-B-1325D

Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247

Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E

Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B

Paint, Traffic, Solvent Based

FED STD 595

Colors used in Government Procurement

AC 150/5340-1

Standards for Airport Markings

**END OF ITEM P-620**

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**ITEM D-701  
PIPE FOR STORM DRAINS AND CULVERTS**

**DESCRIPTION**

**701-1.1** This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

**MATERIALS**

**701-2.1** Materials shall meet the requirements shown on the plans and specified below.

**701-2.2 PIPE.** The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76     Standard Specification for Reinforced Concrete Culvert, 18-inch and 24-inch diameter.

**701-2.3 CONCRETE.** Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi (13.8 MPa) at 28 days and conform to the requirements of ASTM C94.

**701-2.4 RUBBER GASKETS.** Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

**701-2.5 JOINT MORTAR.** Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

**701-2.6 JOINT FILLERS.** Poured filler for joints shall conform to the requirements of ASTM D6690.

**701-2.7 PLASTIC GASKETS.** Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

**701-2.8. CONTROLLED LOW-STRENGTH MATERIAL (CLSM).** CLSM is not allowed.

**CONSTRUCTION METHODS**

**701-3.1 EXCAVATION.** The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches (150 mm) on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational

Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch (200 mm) or 1/2 inch (12 mm) for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches (150 mm) in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

**701-3.2 BEDDING.** The pipe bedding shall conform to the class specified on the plans. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

**a. Rigid pipe.** Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches (150 mm) below the bottom of the pipe and extending up around the pipe for a depth of not less than 30% of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least 10% of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be sand or select sandy soil with 100% passing a 3/8-inch (9 mm) sieve and not more than 10% passing a No. 200 (0.075 mm) sieve.

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

**b. Flexible pipe.** For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth		Minimum Bedding Depth	
inch	mm	inch	mm
1/2	12	1	25
1	25	2	50
2	50	3	75
2-1/2	60	3-1/2	90

**c. PVC, polyethylene, and polypropylene pipe.** For PVC, polyethylene, and polypropylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches (19 mm). For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches (150 mm) below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

**701-3.3 LAYING PIPE.** The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

**701-3.4 JOINING PIPE.** Joints shall be made with (1) Portland cement mortar, (2) Portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

**a. Concrete pipe.** Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.

**b. Metal pipe.** Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

**c. PVC, polyethylene and polypropylene pipe.** Joints for PVC, Polyethylene, and Polypropylene pipe shall conform to the requirements of ASTM D3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the

requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

**701-3.5 BACKFILLING.** Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing or shall meet the requirements of Item P-153. It shall not contain frozen lumps, stones that would be retained on a 2-inch (50 mm) sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing a 1/2-inch (12 mm) sieve, with 95% or more being retained on the No. 4 (4.75 mm) sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches (150 mm) on each side of the pipe and shall be brought up one foot (30 cm) above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches (150 mm) and shall be brought up evenly on each side of the pipe to one foot (30 cm) above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet (3.7 m), whichever is less.

For PVC, polyethylene, and polypropylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches (300 mm) over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

## METHOD OF MEASUREMENT

**701-4.1** The length of pipe shall be measured in linear feet (m) of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

**701-4.2** The quantity of end sections shall be the number of ends installed.

## BASIS OF PAYMENT

**701-5.1** Payment will be made at the contract unit price per linear foot (meter) for each kind of pipe of the type and size designated and at the contract unit price for each end section.

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-701a	24-inch RCP Culvert - per linear foot
Item D-701b	24-inch RCP End Sections – per each
Item D-701c	18-inch RCP Culvert – per linear foot
Item D-701d	18-inch RCP End Sections – per each

### **MATERIAL REQUIREMENTS**

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches

ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

**END ITEM D-701**

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## **ITEM L-101 AIRPORT ROTATING BEACONS**

### **DESCRIPTION**

**101-1.1** This item shall consist of furnishing and installing airport rotating beacons. The work shall also include mounting, leveling, wiring, painting, servicing, and testing of the beacon. In addition, this item also includes all materials and incidentals necessary to place the beacon in an operating condition (as a completed unit) to the satisfaction of the Engineer. This item shall include a mounting platform if specified in the plans.

### **EQUIPMENT AND MATERIALS**

#### **101-2.1 GENERAL**

**a.** Airport lighting equipment and materials covered by advisory circulars (ACs) must be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials that are per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer and replaced with materials, that are per these specifications, at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly mark each copy to identify the products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components or electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the Contract Documents plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

**f.** All equipment and materials furnished and installed in this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**101-2.2 BEACON.** The beacon shall be a Type L-801A Class 1 beacon meeting the requirements of AC 150/5345-12, Specification for Airport and Heliport Beacons.

**101-2.3 BEACON INSTALLATION.** See AC 150/5340-30, Design and Installation Details for Airport Visual Aids, for beacon installation details. Provide two lamp sets as spares.

**101-2.4 PANEL BOARDS AND BREAKERS.** Panel boards and breakers shall conform to the requirements of Federal Specification W-P-115, Panel, Power Distribution.

**101-2.5 WEATHERPROOF CABINETS.** The weatherproof cabinets shall conform to National Electrical Manufacturers Association Standards (NEMA) and shall be constructed of steel not less than No. 16 United States Standard (USS) gauge.

**101-2.6 ELECTRICAL WIRE.** For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be the type, size, number of conductors, and voltage shown in the plans or in the proposal.

**101-2.7 CONDUIT.** Rigid steel conduit and fittings shall be per Underwriters Laboratories Standards 6, 514B, and 1242.

**101-2.8 PAINT.**

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Paint 25.

b. Priming paint for galvanized metal surfaces shall be a zinc-rich epoxy primer paint per MIL-DTL-24441/19B, Formula 159, Type III. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint meeting the requirements of Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint per the Master Painter's Institute, Reference #9, Exterior Alkyd, Gloss, volatile organic content (VOC) Range E2.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above-specified orange or white paint with 1/2 pint (0.24 liter (l)) of raw linseed oil to each gallon (liter).

## **CONSTRUCTION METHODS**

**101-3.1. PLACING THE BEACON.** The beacon shall be mounted on a beacon tower, platform, or building roof as shown in the plans.

**101-3.2 HOISTING AND MOUNTING.** The beacon shall be hoisted to the mounting platform by using suitable slings and hoisting tackle. Before fastening the beacon to the mounting platform, the mounting holes shall be checked for correct spacing. Beacon base or mounting legs shall not be strained or forced out of position to fit incorrect spacing of mounting holes. The beacon base shall be raised first, set in position, and bolted in place. The drum shall then be raised and assembled to the base.

**101-3.3 LEVELING.** After the beacon has been mounted, it shall be accurately leveled following the manufacturer's instructions. The leveling shall be checked in the presence of the Engineer and shall be to the Engineer's satisfaction.

**101-3.4 SERVICING.** Before placing the beacon in operation, the Contractor shall check the manufacturer's manual for proper servicing requirements. Follow the manufacturer's servicing instructions for each size of beacon.

**101-3.5 BEAM ADJUSTMENT.** After the beacon has been mounted and leveled, the elevation of the beam shall be adjusted. The final beam adjustments shall be made at night so that results can be readily observed. The beams shall be adjusted to the elevation directed by the Engineer or as shown in the plans. See AC 150/5340-30 for additional information about airport beacon beam adjustment.

**101-3.6 BEACON MOUNTING PLATFORM.** Where the beacon is to be mounted at a location other than the beacon tower and where a special mounting platform is required, the construction of the mounting platform and any necessary lightning protection equipment shall be per the details shown in the plans.

**101-3.7 WIRING.** The Contractor shall furnish all necessary labor and materials and shall make complete above ground electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electrical Code (NEC). Copies of the National Electric Code may be obtained from the NFPA website: [http://www.nfpa.org/aboutthecodes/list\\_of\\_codes\\_and\\_standards.asp](http://www.nfpa.org/aboutthecodes/list_of_codes_and_standards.asp)

If underground cable for the power feed from the transformer vault to the beacon site and duct for this cable installation is required, the cable, ground rods and duct shall be installed per and paid for as described in Item L-108, Underground Power Cable for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduit.

Unless otherwise specified, the Contractor shall connect the tell-tale relay mechanism in the beacon to energize the tower obstruction light circuit when failure of the beacon service (primary) lamp occurs.

If lightning protection is specified in the plans or proposal as a part of this item, it shall be installed per paragraph 103-2.3 in Item L-103, Airport Beacon Towers.

**101-3.8 PANEL AND CABINET.** Unless otherwise specified, the Contractor shall furnish and install at the top of the beacon tower or mounting platform a circuit-breaker panel consisting of four 15-ampere breakers mounted in a weather-proof cabinet to provide separate protection for the circuits to the beacon lamps, motor, obstruction lights, and other equipment. The cabinet shall be located on the side of the beacon platform, as directed by the Engineer.

**101-3.9 CONDUIT.** All exposed wiring shall be run in not less than 3/4 inch (19 mm) galvanized rigid steel conduit. Outdoor rated, liquid-tight, flexible metal conduit may be used for final connection at the beacon equipment. No conduit shall be installed on top of a beacon platform floor. All conduits shall be installed to provide for drainage. If mounted on a steel beacon tower, the conduit shall be fastened to the tower members with Wraplock® straps (or equivalent), clamps, or approved fasteners, spaced approximately 5 feet (1.5 m) apart. The conduit shall be fastened to wooden structures with galvanized pipe straps and with galvanized wood screws not

less than No. 8 or less than 1-1/4 inches (32 mm) long. There shall be at least two fastenings for each 10 feet (3 m) length.

**101-3.10 BOOSTER TRANSFORMER.** If shown in the plans or specified in job specifications, a booster transformer to compensate for voltage drop to the beacon shall be installed in a suitable weatherproof housing under or on the tower platform or at the base of the tower. The installation shall be as indicated in the plans and described in the proposal. If the booster transformer is required for installation remote from the beacon, it shall be installed per and paid for as part of the beacon installation.

**101-3.11 PHOTOELECTRIC CONTROL.** If shown in the plans or specified in the job specifications, the Contractor shall furnish and install an automatic control switch at the location indicated in the plans. The switch shall be a photoelectric type. It shall be a standard commercially available unit that will energize when the illumination on a vertical surface facing North decreases to 25 to 35 foot-candles (269 to 377 lux). The photoelectric switch should de-energize when the illumination rises to 50 to 60 foot-candles (538 to 646 lux). The photoelectronic switch shall be installed, connected, and adjusted per the manufacturer's instructions.

**101-3.12 OBSTRUCTION LIGHTS.** Unless otherwise specified, the Contractor shall install on the top of the beacon tower or mounting platform two L-810 obstruction lights on opposite corners. These lights shall be mounted on conduit extensions to a height of not less than 4 inches (100 mm) above the top of the beacon.

**101-3.13 PAINTING.** If construction of a wooden mounting platform is stipulated in the proposal as part of this item, all wooden parts of the platform shall be given one priming coat of white or aviation-orange paint after fabrication but before erection and one body and one finish coat of international-orange paint after erection. Steel mounting platforms shall be given one priming coat of corrosion-inhibiting primer before erection and one body and one finish coat of international-orange paint after erection. All equipment installed under this contract and exposed to the weather shall be given one body and one finish coat of international-orange (per Federal Standard 595, Number 12197) or white paint as required. This shall include the beacon (except glass surfaces), beacon base, breaker cabinet, all conduit, and transformer cases. It shall not include lightning protection system air terminals or obstruction light globes.

Skilled painters must apply the paint uniformly at the proper consistency. The finished paint shall be free from sags, holidays, and smears. Each coat of paint shall be given ample time to dry and harden before the next coat of paint is applied. A minimum of three (3) days shall be allowed for drying on wood surfaces, and a minimum of four (4) days shall be allowed for drying on metal surfaces. Painting shall not be performed in cold, damp, foggy, dusty, or frosty atmospheres, or when the air temperature is below 40°F (4°C), nor started when the weather forecast indicates such conditions for the day.

All surfaces shall be cleaned before painting. The surfaces shall be dry and free from scale, grease, rust, dust, and dirt. All knots in wood surfaces shall be covered with shellac immediately before applying the priming coat of paint. Nail holes and permissible imperfections shall be filled with putty. The ready-mixed paint shall be thinned for the priming and body coats per the manufacturer's recommendations. In the absence of such recommendations, the following shall apply:

**a. Body coats (for both wood and steel surfaces)** - add 1/2 pint (0.24 liter) of turpentine to each gallon (liter) of ready-mixed paint for body coats.

b. Finish coats (for both wood and steel surfaces) the ready-mixed paint shall be used as it comes from the container for finish coats.

**101-3.14 TESTING.** The beacon installation shall be fully tested as a completed unit prior to acceptance. These tests shall include operation of the lamp-changer and performing insulation resistance and voltage readings. The insulation resistance to ground of the beacon power supply circuit shall be not less than 100 megohms when measured ungrounded. The Contractor must furnish testing equipment. Tests shall be conducted in the presence of the Engineer and shall be to the Engineer's satisfaction.

### **METHOD OF MEASUREMENT**

**101-4.1** The quantity to be paid for shall be the number of beacons installed as completed units in place, accepted, and ready for operation.

### **BASIS OF PAYMENT**

**101-5.1** Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-101                      Airport Rotating Beacon - per each

### **MATERIAL REQUIREMENTS**

AC 150/5345-7              Specification for L-824 Underground Cable for Airport Lighting Circuits

AC 150/5345-12            Specification for Airport and Heliport Beacons

AC 150/5340-30            Design and Installation Details for Airport Visual Aids

AC 150/5345-53            Airport Lighting Equipment Certification Program

Commercial Item Description A-A-59544  
Cable and Wire, Electrical (Power, Fixed Installation)

FED SPEC W-P-115      Panel, Power Distribution

FED STD 595                Colors Used in Government Procurement

MPI Reference #9        Alkyd, Exterior, Gloss (MPI Gloss Level 6)

MIL-DTL-24441C/19B    Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

NFPA-70                    National Electric Code (NEC)

NFPA-780                  Standard for the Installation of Lightning Protection Systems

SSPC Paint 25 BCS        Zinc Oxide, Alkyd, Linseed Oil, Primer for

Underwriters Laboratories Standard 6  
Electrical Rigid Metal Conduit – Steel

Underwriters Laboratories Standard 514B  
Conduit, Tubing, and Cable Fittings

Underwriters Laboratories Standard 1242  
Electrical Intermediate Metal Conduit - Steel

**END OF ITEM L-101**

**ITEM L-103  
AIRPORT BEACON TOWERS**

**DESCRIPTION**

**103-1.1** This item shall consist of furnishing and installing an airport beacon tower of the type shown in the plans, per these specifications. This work shall include the clearing of the site, erection of the tower, installation of lightning protection, painting, and all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer. See advisory circular (AC) 150/5340-30 for additional installation information about airport beacon towers.

**EQUIPMENT AND MATERIALS**

**103-2.1 GENERAL.**

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials, that are per these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals to components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**103-2.2 TOWER.** The beacon tower shall be per AC 150/5340-30, Design and Installation Details for Airport Visual Aids, Chapter 6.

**103-2.3 LIGHTNING PROTECTION.** Lightning protection shall comply with NFPA-780, Standard for the Installation of Lightning Protection Systems. All materials shall comply with NFPA 780

Class II material requirements regardless of the tower height. Ground rods and underground cables shall be installed per and paid as described in Item L-108, Underground Power Cable for Airports.

#### **103-2.4 PAINT.**

a. Priming paint for galvanized steel towers shall be zinc dust-zinc oxide primer paint per MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

b. Priming paint for non-galvanized steel towers shall be a high solids alkyd primer per the Master Painter's Institute (MPI), Reference #9, Exterior Alkyd, Gloss.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint MPI Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange Number 12197.

d. White paint for a steel tower shall be ready-mixed paint per MPI #8.

### **CONSTRUCTION METHODS**

**103-3.1 CLEARING AND GRADING.** The site on which the beacon tower is to be erected shall be cleared and leveled. All trees and brush shall be removed from the area within a distance of 25 feet (7.5 m) from the tower or as called for in the plans. Stumps shall be removed to a depth of 18 inches (0.5 m) below finished grade and the excavation filled with earth and tamped. If a transformer vault or other structure is included as part of the installation, the area shall be cleared to a distance of 25 feet (7.5 m) from these structures. The ground near the tower shall be leveled to permit the operation of mowing machines. The leveling shall extend at least 2 feet (60 cm) outside the tower legs. All debris removed from the tower site shall be disposed of by the Contractor to the satisfaction of the Engineer and per Federal, state, or local regulations.

**103-3.2 EXCAVATION AND FILL.** Excavation for the tower footings shall be carried to a minimum of 4 inches (100 mm) below the footing depth. The excess excavation below the footing depth shall then be backfilled with gravel or crushed stone and compacted to the required level. The footing plates shall be installed, and a thickness of not less than 18 inches (0.5 m) of the same gravel or crushed stone shall be placed immediately above the footing plates in layers of not over 6 inches (150 mm). Each layer above the footing plates shall be thoroughly tamped in place. The remainder of the backfill may be of excavated earth placed in layers not to exceed 6 inches (150 mm). Each layer shall be thoroughly compacted by tamping.

Where solid rock is encountered, which prevents the carrying of the foundation legs to the required depth but which is of sufficient strength to use hold-down bolts, the tower anchor posts shall be cut off at the required length and the hold-down bolts shall be installed as indicated in the plans with the approval of the Engineer. Each tower leg shall be anchored to the rock by means of two 7/8 inch (22 mm) diameter by 3 feet (1 m) long expansion or split bolts and shall be grouted with neat Portland cement into holes drilled into the natural rock. Except as required for rock foundations, the footing members shall not be cut off or shortened. If excavated material is of such consistency that it will not readily compact when backfilled, the Engineer may order the excavation backfilled with concrete or other suitable material.

The concrete footing for tubular beacon towers shall be installed per the manufacturer's recommendations. Portions of the footing in the topsoil layer shall not be included in the footing height.

**103-3.3 ERECTION.** Detailed erection drawings furnished by the manufacturer shall be strictly followed during construction. All towers shall be erected in sections from the ground up unless otherwise specified. For final assembly, all bolts and fastenings shall be installed, and the structure shall be plumb, true, square, and level. Nuts shall be taken up to a firm bearing after which the bolts shall, if necessary, be cut to proper length to protrude three full threads. Approved locknuts shall be placed on each bolt over the regular nut. Ladder bolts shall be inserted with the head to the outer face of the tower. Diagonal, leg, and handrail bolts shall be installed with nuts on the outer face of the tower, unless otherwise specified. Bent parts shall be straightened before erection without damage to the protective coating. Surfaces abraded or bared of protective coating shall be painted with the proper priming paint per these specifications.

The Contractor shall install the ladder on the side of the tower adjacent to the driveway or most accessible approach to the tower. Tubular beacon towers shall be erected per the manufacturer's recommendations. The safety cable shall be located on the side of the tower adjacent to the driveway or most accessible approach to the tower.

**103-3.4 LIGHTNING PROTECTION.** Lightning protection shall be per NFPA-780, Standard for the Installation of Lightning Protection Systems. All materials shall comply with Class II requirements regardless of tower height. Ground rods and underground cables shall be installed per and paid as described in Item L-108, Underground Power Cable for Airports.

The Contractor shall furnish and install a Class II lightning protection system in accordance with NFPA 780.

Down-conductor cables shall be securely fastened to the surface of the tower leg at 5 feet (1.5 m) intervals with suitable bronze fasteners having bronze or noncorrosive metal bolts. Sharp turns or bends in the down conductor will not be permitted.

All connections of cable to cable, cable to air terminals, and cable to ground plates or rods shall be made with solder-less connectors or noncorrosive metal approved by the Engineer and shall be of substantial construction.

The down-conductor cable shall be securely attached to ground rods or plates placed at least 2 feet (60 cm) away from the tower foundations. The ground rod shall be driven into the ground so that the top is at least 6 inches (150 mm) below grade. The down-conductor shall be firmly attached to the ground plate or rod by means of a exothermic weld only. Plates shall be embedded in an area of permanent moisture.

The complete lightning protection installation shall be accomplished to the satisfaction of the Engineer. The resistance to ground of any part of the lightning protection system shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod.

**103-3.5 PAINTING.** The Contractor shall furnish all materials and labor for painting the beacon tower. The color scheme for the steel tower shall be as shown in the plans.

**a. Parts to be painted.** Tower parts (except those parts to be exposed to earth) shall not be treated or primed before erection. All tower parts placed below ground level or within 12 inches (300 mm) above ground level shall be given two coats of approved bituminous paint.

Skilled painters must apply the proper consistency of paint uniformly. The finished paint shall be free from sags, holidays, and smears. Division lines between colors shall be sharply defined. Each coat of paint shall be given ample time to dry and harden before the next coat is applied. A minimum of four (4) days shall be allowed for drying on metal surfaces. Painting shall not be done in cold, damp, foggy, or dusty atmospheres, or when air temperature is below 40°F (4°C), nor started when the weather forecast indicates such conditions for the day.

All surfaces shall be cleaned before painting. The surfaces shall be dry and free from scale, grease, rust, dust, and dirt when paint is applied.

The number of coats of paint applied shall be per the following instructions:

**b. Steel towers, galvanized.** One priming coat of zinc dust-zinc oxide primer after erection and one body and one finish of white or orange paint (as required by the color scheme) shall be applied after erection.

**c. Steel towers, not galvanized.** One priming coat of corrosion-inhibiting primer and one body and one finish coat of white or orange paint (as required by the color scheme) shall be applied after erection.

The above specified orange and white ready-mixed paints shall be thinned for the body coats per the manufacturer's recommendations. In the absence of such recommendations, the following shall apply:

**d. Body coats.** Add not more than 1/2 pint (0.24 liters) of turpentine to each gallon (liter) of ready-mixed paint for body coats.

**e. Finish coats.** The ready-mixed paint shall be used as it comes from the container for finish coats.

## METHOD OF MEASUREMENT

**103-4.1** The quantity to be paid for under this item shall be the number of airport beacon towers installed as completed units in place, accepted, and ready for operation.

## BASIS OF PAYMENT

**103 5.1** Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-103      Beacon Tower and Foundation - per unit

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**MATERIAL REQUIREMENTS**

AC 150/5340-30      Installation and Design Details for Airport Visual Aids

MPI Reference #8      Alkyd, Exterior, Flat (MPI Gloss Level 1)

MPI Reference #9      Alkyd, Exterior, Gloss (MPI Gloss Level 6)

FED STD 595      Colors Used in Government Procurement

MIL-DTL-24441C/19B      Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III

NFPA-780      Standard for the Installation of Lightning Protection Systems

Society for Protective Coatings (SSPC) Paint 25 BCS  
Zinc Oxide, Alkyd, Linseed Oil, Primer for

**END OF ITEM L-103**

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**ITEM L-107  
AIRPORT WIND CONES**

**DESCRIPTION**

**107-1.1** This item shall consist of furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the Engineer.

**EQUIPMENT AND MATERIALS**

**107-2.1 GENERAL.**

a. Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications, at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**107-2.2 WIND CONES.** The primary wind cone assembly shall be Type L-807, Style I-A, Size 2 meeting the requirements of AC 150/5345-27, Specification for Wind Cone Assemblies.

**107-2.3 ELECTRICAL WIRE AND CABLE.** Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

**107-2.4 CONDUIT.** Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

**107-2.5 PLASTIC CONDUIT (FOR USE BELOW GRADE ONLY).** Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

a. Type I—Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II—Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

**107-2.6 CONCRETE.** The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Structural Portland Cement Concrete.

**107-2.7 PAINT.**

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Specification - Paint 25, Primer, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments).

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

### CONSTRUCTION METHODS

**107-3.1 INSTALLATION.** The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

**107-3.2 SUPPORT POLE ERECTION.** The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

**107-3.3 ELECTRICAL CONNECTION.** The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

If underground cable from the transformer vault to the wind cone site and duct for this cable installation is required, the cable and duct shall be installed in accordance with and paid for as described in Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits.

**107-3.4 BOOSTER TRANSFORMER.** If shown in plans or specified in the job specifications, a booster transformer to compensate for voltage drop to the lamps shall be installed in a suitable weatherproof housing. The booster transformer shall be installed as indicated in the plans and described in the proposal. If the booster transformer is required for installation remotely from the wind cone, it shall be installed in accordance with and paid for as part of the wind cone installation.

**107-3.5 GROUND CONNECTION AND GROUND ROD.** The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the "A" frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of No. 6 American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod.

**107-3.6 PAINTING.** Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

**107-3.7 LIGHT SOURCES.** The Contractor shall furnish and install lamps per the manufacturer's instruction book.

**107-3.8 CHAIN AND PADLOCK.** The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the Engineer.

**107-3.9 SEGMENTED CIRCLE.** The segmented circle shall be constructed in accordance with AC 150/5340-5, Segmented Circle Airport Marker System, and the details in the Plans.

### METHOD OF MEASUREMENT

**107-4.1** The quantity to be paid shall be the number of wind cones and segmented circle airport marker systems installed as completed units in place, accepted, and ready for operation.

### BASIS OF PAYMENT

**107-5.1** Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-107	12-Foot Wind Cone and Segmented Circle - per each
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### MATERIAL REQUIREMENTS

AC 150/5340-5	Segmented Circle Airport Marker System
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AC 150/5340-30	Design and Installation Details for airport Visual Aids
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AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
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AC 150/5345-27	Specification for Wind Cone Assemblies
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AC 150/5345-53	Airport Lighting Equipment Certification Program
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Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
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FED STD 595	Colors Used in Government Procurement
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MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
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Underwriters Laboratories Standard 6  
Electrical Rigid Metal Conduit – Steel

Underwriters Laboratories Standard 514B  
Conduit, Tubing, and Cable Fittings

Underwriters Laboratories Standard 514C  
Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

Underwriters Laboratories Standard 651  
Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

Underwriters Laboratories Standard 651A  
Type EB and A Rigid PVC Conduit and HDPE Conduit

Underwriters Laboratories Standard 1242  
Electrical Intermediate Metal Conduit - Steel

NFPA-70                      National Electric Code (NEC)

**END OF ITEM L-107**

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**ITEM L-108**  
**UNDERGROUND POWER CABLE FOR AIRPORTS**

**DESCRIPTION**

**108-1.1** This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is in Item L-110, Airport Underground Electrical Duct Banks and Conduits.

**EQUIPMENT AND MATERIALS**

**108-2.1 GENERAL.**

**a.** Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain a minimum insulation resistance per AC 150/5340-26B, Maintenance Airport Visual Aid Facilities, Table 5-1 and paragraph 5.1.3.1, with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

**108-2.2 CABLE.** Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge AWG), L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2, 75°C. Conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600 volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

**108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS).** Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for ground wire per ASTM B3 and ASTM B8, and shall be bare copper wire per ASTM B33. See AC 150/5340-30 for additional details about counterpoise and ground wire types and installation. For voltage powered circuits, the equipment ground conductor shall be minimum No. 6 AWG, 600V rated, Type XHHW insulated, green color, stranded copper equipment ground conductor.

Ground rods shall be copper. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 8 feet (2.4 m) long and 5/8 inch (16 mm) in diameter.

**108-2.4 CABLE CONNECTIONS.** In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

**a. The cast splice.** A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or as manufactured by Hysol® Corporation, "Hyseal Epoxy Splice" Kit No. E1135, or an approved equivalent, used for potting the splice is acceptable.

**b. The field-attached plug-in splice.** Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

**c. The factory-molded plug-in splice.** Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

**d. The taped or heat-shrink splice.** Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. See AC 150/5340-30 for additional information about methods of attaching a ground to a galvanized light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

**108-2.5 SPLICER QUALIFICATIONS.** Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

**108-2.6 CONCRETE.** Concrete for cable markers shall be per Specification Item P-610, Structural Portland Cement Concrete.

**108-2.7 FLOWABLE BACKFILL.** Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**108-2.8 CABLE IDENTIFICATION TAGS.** Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

**108-2.9 TAPE.** Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

**108-2.10 ELECTRICAL COATING.** Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

**108-2.11 EXISTING CIRCUITS.** Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the Engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms acceptable to the Engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

**108-2.12 DETECTABLE WARNING TAPE.** Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

## CONSTRUCTION METHODS

**108-3.1 GENERAL.** The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed or at least once in each access point where L-823 connectors are not installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

**108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS.** This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

**108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES.** Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

**a. Trenching.** Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

**(1)** When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.

**(2)** Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

Dewatering necessary for cable installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay items as part of Item L-108. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-108 Item.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6 mm) sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

**b. Backfilling.** After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall be 3 inches (75 mm) deep, loose measurement, and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the compaction requirements per Item P-152 for that area shall be followed.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall

also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 4-6 inch (100 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inch (200 mm) minimum below finished grade.

**c. Restoration.** Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the seeding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

**108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE.** The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep.

At the location of each underground cable connection, except at lighting units, or isolation transformers, or power a concrete marker slab must mark adapters placed above the connection. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the Engineer. Furnishing and installation of cable markers is incidental to the respective cable pay item.

**108-3.5 SPLICING.** Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

**a. Cast splices.** These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the Engineer.

**b. Field-attached plug-in splices.** These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber

or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

**c. Factory-molded plug-in splices.** These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint.

**d. Taped or heat-shrink splices.** A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminants prior to application.

Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

**108-3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING.** If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based on the frequency of local lightning:

**a. Equipotential.** – may be used by the Engineer for areas that have high rates of lightning strikes. This is where the counterpoise is bonded to the light base (edge lights included) and counterpoise size is determined by the Engineer.

**b. Isolation** – used in areas where lightning strikes are not common. The counterpoise is not bonded to edge light fixtures, in-pavement fixtures are bonded to the counterpoise. Counterpoise size is selected by the Engineer.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables.

For edge light fixtures installed in turf (stabilized soils) and for raceways or cables adjacent to the full-strength pavement edge, the counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade.

Each light base or mounting stake shall be provided with a grounding electrode.

When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

**c.** A ground rod installed at and securely attached to each light fixture base, mounting stake, and to all metal surfaces at junction/access structures via #6 AWG wire.

**d.** For parallel voltage systems only, install a #6 AWG green insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base internal grounding lug and to all metal surfaces at junction/access structures. Dedicated ground rods shall be installed and exothermically welded to the counterpoise wires at each end of a duct bank crossing under pavement.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

**108-3.7 COUNTERPOISE INSTALLATION ABOVE MULTIPLE CONDUITS AND DUCT BANKS.** Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22-1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

**108-3.8 COUNTERPOISE INSTALLATION AT EXISTING DUCT BANKS.** When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

**108-3.9 EXOTHERMIC BONDING.** Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

- a. All slag shall be removed from welds.
- b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See also AC 150/5340-30 for galvanized light base exception.
- c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

**108-3.10 TESTING.** The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

- a. Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.
- b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and

tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 100 megohms.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

## METHOD OF MEASUREMENT

**108-4.1** The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

**108-4.2** Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack.

### BASIS OF PAYMENT

**108-5.1** Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108a	No. 8 AWG, L-824, Type C Cable, Installed in Conduit (Edge Lights) - per liner foot
Item L-108b	Bare No. 6 Counterpoise Wire, Installed in Trench, Including Ground Rods and Ground Connectors - per liner foot
Item L-108c	No. 12 AWG THWN – 2 Cable, Installed in Conduit (Beacon) - per liner foot
Item L-108d	Bare No. 12 Ground Wire, Installed in Conduit (Beacon) - per liner foot
Item L-108e	No. 6 AWG THWN-2 Cable, Installed in Conduit (Wind Cone) - per liner foot
Item L-108f	Bare No. 8 Ground Wire, Installed in Conduit (Wind Cone) - per liner foot

### MATERIAL REQUIREMENTS

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program
Commercial Item Description A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
Commercial Item Description A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes

ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes
FED SPEC J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

#### **REFERENCE DOCUMENTS**

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems
MIL-S-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

**END OF ITEM L-108**

**ITEM L-109**  
**AIRPORT TRANSFORMER VAULT AND VAULT EQUIPMENT**

**DESCRIPTION**

**109-1.1** This item shall consist of constructing an airport transformer vault or a prefabricated metal housing per these specifications and per the design and dimensions shown in the plans. This work shall also include the installation of conduits in the floor and foundation, painting and lighting of the vault or metal housing, and the furnishing of all incidentals that are necessary to produce a completed unit. Included as a separate part under this item or as a separate item where an existing vault is to be used shall be the furnishing of all vault equipment, wiring, electrical buses, cable, conduit, potheads, and grounding systems. This work shall also include the painting of equipment and conduit; the marking and labeling of equipment and the labeling or tagging of wires; the testing of the installation; and the furnishing of all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

**EQUIPMENT AND MATERIALS**

**109-2.1 GENERAL.**

**a.** Airport lighting equipment and materials covered by advisory circulars (AC) shall be certified and listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

**f.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from

final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

## **CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING**

**109-2.2 CONCRETE.** The concrete for the vault shall be proportioned, placed, and cured per Item P-610, Structural Portland Cement Concrete, using 3/4 inch (19 mm) maximum size coarse aggregate.

**109-2.3 REINFORCING STEEL.** Reinforcing steel bars shall be intermediate or structural grade deformed-type bars and shall be per ASTM A615.

**109-2.4 BRICK.** Brick shall be per ASTM C62, Grade SW.

**109-2.5 RIGID STEEL CONDUIT.** Rigid steel conduit and fittings shall be per Underwriters Laboratories Standards 6 and 514B.

**109-2.6 PLASTIC CONDUIT AND FITTINGS.** Plastic Conduit and fittings shall conform to the requirements of Federal Specification W-C-1094 and UL-651 and UL-654 schedule 40 polyvinyl chloride (PVC) suitable for use above or below ground.

**109-2.7 LIGHTING.** Vault or metal-housing light fixtures shall be of a vapor-proof type.

**109-2.8 OUTLETS.** Convenience outlets shall be heavy-duty duplex units designed for industrial service.

**109-2.9 SWITCHES.** Vault or metal-housing light switches shall be single-pole switches.

### **109-2.10 PAINT.**

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer per Society for Protective Coatings (SSPC) Specification – Paint 25, Primer, Raw Linseed Oil and Alkyd Primer, (Without Lead and Chromate Pigments).

b. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the Master Painter's Institute (MPI), Reference #9, Exterior Alkyd, Gloss.

c. Priming paint for wood surfaces shall be mixed on the job by thinning the specified white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

d. Paint for the floor, ceiling, and inside walls shall be per Porter Paint Company 69, 71, and 79 or equivalent. Walls and ceiling shall be light gray and the floor shall be medium gray.

e. The roof coating shall be hot asphalt material per ASTM D2823. Asbestos-free roof coating per ASTM D4479 may be substituted if required by local codes.

**109-2.11 GROUND BUS.** Ground bus shall be 1/8 × 3/4 inch (3 × 19 mm) minimum copper bus bar.

**109-2.12 SQUARE DUCT.** Duct shall be square similar to that manufactured by the Square D Company (or equivalent), or the Trumbull Electric Manufacturing Company (or equivalent). The entire front of the duct on each section shall consist of hinged or removable cover for ready access

to the interior. The cross-section of the duct shall be not less than 4 × 4 inch (100 × 100 mm) except where otherwise shown in the plans.

**109-2.13 GROUND RODS.** Ground rods shall be in accordance with L-108.

**109-2.14 POTHEADS.** Potheads shall be similar to Gear and Williams (G&W) Type N, Shape C (or equivalent), unless otherwise specified. Potheads shall be furnished with plain insulator bushings and conduit couplings. Potheads shall have a rating not less than the circuit voltage.

**109-2.15 VAULT PREFABRICATED METAL HOUSING.** The prefabricated metal housing shall be a commercially available unit.

**109-2.16 FAA-APPROVED EQUIPMENT.** Certain items of airport lighting equipment installed in vaults are covered by individual ACs listed below:

AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.
AC 150/5345-49	Specification for L-854, Radio Control Equipment

**109-2.17 OTHER ELECTRICAL EQUIPMENT.** Distribution transformers, oil switches, cutouts, relays, terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of electrical equipment not covered by FAA equipment specifications and ACs shall conform to the applicable rulings and standards of the Institute of Electrical and Electronic Engineers (IEEE) or the National Electrical Manufacturers Association (NEMA). When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first-grade product. This equipment shall be supplied in the quantities required for the specific project and shall incorporate the electrical and mechanical characteristics specified in the proposal and plans. Equipment selected and installed by the Contractor shall maintain the interrupting current rating of the existing systems or specified rating whichever is greater.

**109-2.18 WIRE.** Wire (in conduit) rated up to 5,000 volts shall be per AC 150/5345-7, Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

**a. Control circuits.** Unless otherwise indicated on the plans, wire shall be not less than No. 12 American wire gauge (AWG) and shall be insulated for 600 volts. If telephone control cable is specified, No. 19 AWG telephone cable per ANSI/Insulated Cable Engineers Association (ICEA) S-85-625-2007 specifications shall be used.

**b. Power circuits.**

(1) 600 volts maximum-Wire shall be No. 6 AWG or larger and insulated for at least 600 volts.

(2) 3,000 volts maximum-Wire shall be No. 6 AWG or larger and insulated for at least 3,000 volts.

(3) Over 3,000 volts-Wire shall be No. 6 AWG or larger and insulated for at least the circuit voltage.

**109-2.19 SHORT CIRCUIT / COORDINATION / DEVICE EVALUATION / ARC FLASH ANALYSIS.** The Contractor shall, based upon the equipment provided, include as a part of the submittal process the electrical system "Short Circuit / Coordination / Device evaluation / Arc Flash Analysis". The analysis shall be performed by the equipment manufacturer and submitted in a written report. The analysis shall be signed and sealed by a registered professional Engineer from the state in which the project is located. The analysis shall comply with NFPA-70E and IEEE 1584.

The analysis will include: one line diagrams, short circuit analysis, coordination analysis, equipment evaluation, arc flash analysis and arc flash labels containing at a minimum, equipment name, voltage/current rating, available incident energy and flash protection boundary.

The selected firms field service Engineer shall perform data gathering for analysis completion and device settings, perform device setting as recommended by the analysis and will furnish and install the arc flash labels. The components worst case incident energy will be considered the available arc flash energy at that specific point in the system. Submit three written copies and one electronic copy of the report.

## **CONSTRUCTION METHODS**

### **CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING**

**109-3.1 GENERAL.** The Contractor shall construct the transformer vault or prefabricated metal housing at the location indicated in the plans. Vault construction shall be reinforced concrete, concrete masonry, or brick wall as specified. The metal housing shall be prefabricated equipment enclosure to be supplied in the size specified. The mounting pad or floor details, installation methods, and equipment placement are shown in the plans.

The Contractor shall clear, grade, and seed the area around the vault or metal housing for a minimum distance of 10 feet (3 m) on all sides. The slope shall be not less than 1/2 inch per foot (12 mm per 0.3 m) away from the vault or metal housing in all directions.

The vault shall provide adequate protection against weather elements, including rain, wind-driven dust, snow, ice and excessive heat. The vault shall have sufficient filtered ventilation, to assure that the interior room temperatures and conditions do not exceed the recommended limits of the electrical equipment to be installed in the vault. The Contractor is responsible for contacting the manufacturer of the equipment to be installed to obtain environmental limitations of the equipment to be installed. Refer to the electrical vault detail plan sheets for construction requirements. The prefabricated building shall include roof, walls and floor in accordance with the details and these specifications.

### 109-3.2 FOUNDATION AND WALLS.

**a. Reinforced concrete construction.** The Contractor shall construct the foundation and walls per the details shown in the plans. Unless otherwise specified, internal ties shall be of the mechanical type so that when the forms are removed the ends of the ties shall be at least one inch (25 mm) beneath the concrete surface; the holes shall be plugged and finished to prevent discoloration. Reinforcing steel shall be placed, as shown in the drawings, and secured in position to prevent displacement during the concrete placement.

The external surfaces of the concrete shall be thoroughly worked during the placing operation to force all coarse aggregate from the surface. Thoroughly work the mortar against the forms to produce a smooth finish free from air pockets and honeycomb.

The surface film of all pointed surfaces shall be removed before setting occurs. As soon as the pointing has set sufficiently, the entire surface inside and outside of the vault shall be thoroughly wet with water and rubbed with a No. 16 carborundum stone, or equivalent quality abrasive, bringing the surface to a paste. All form marks and projections shall be removed. The surface produced shall be smooth and dense without pits or irregularities. The materials which have been ground into a paste during the rubbing process shall be spread or brushed uniformly over the entire surface (except the interior surfaces that are to be painted shall have all paste removed by washing before painting) and permitted to reset. Final exterior finish shall be obtained by rubbing with No. 30 carborundum stone, or an equivalent quality abrasive. The surface shall be rubbed until the entire surface is smooth and uniform in color.

**b. Brick and concrete construction.** When this type of construction is specified, the foundation shall be concrete conforming to the details shown in the plans. The outer edge of the foundation at the floor level shall be beveled 1-1/2 inches (38 mm) at 45 degrees. Brick walls shall be 8 inches (200 mm) thick, laid in running bond with every sixth course a header course. Brick shall be laid in cement mortar (one part masonry cement and 3 parts sand) with full mortar bed and shovelled joints. All joints shall be completely filled with mortar, and facing brick shall be back-parged with mortar as work progresses. All joints shall be 3/8 inch (9 mm) thick, exterior joints tooled concave, and interior joints struck flush. Both interior and exterior brick surfaces shall be cleaned and nail holes, cracks and other defects filled with mortar. When specified, a nonfading mineral pigment mortar coloring shall be added to the mortar. Steel reinforcing bars, 3/8 inch (9 mm) in diameter and 12 inches (300 mm) long, shall be set vertically in the center of the brick wall on not more than 2 feet (60 cm) centers to project 2-1/2 inches (60 mm) into the concrete roof slab. Lintels for supporting the brickwork over doors, windows, and louvers shall consist of two 4 × 3 × 3/8-inch (100 × 75 × 9 mm) steel angles. Lintels shall be painted with one coat of corrosion-inhibiting primer before installation, and all exposed parts shall be painted similar to doors and window sash after installation.

Window sills may be concrete poured in place or precast concrete as indicated in the plans. All exposed surfaces shall have a rubbed finish as specified under reinforced concrete construction. After completion, all interior and exterior faces of walls shall be scrubbed with a solution of muriatic acid and water in the proportions of not less than one part acid to 10 parts of water. All traces of efflorescence, loose mortar, and mortar stain shall be removed, and the walls washed down with clear water.

**c. Concrete masonry construction.** When this type of construction is specified, the foundation shall be concrete conforming to the details shown in the plans. The concrete masonry units shall be standard sizes and shapes and shall conform to ASTM C90 and shall include the

closures, jambs, and other shapes required by the construction as shown in the plans. Standard construction practice shall be followed for this type of work including mortar, joints, reinforcing steel for extensions into roof slab, etc. Plaster for interior walls, if specified, shall be Portland cement plaster.

**109-3.3 ROOF.** The roof shall be reinforced concrete as shown in the plans. Reinforcing steel shall be placed as shown in the drawing and secured in position to prevent displacement during the pouring of the concrete. The concrete shall be poured monolithically and shall be free of honeycombs and voids. The surface shall have a steel-troweled finish and shall be sloped as shown in the drawing. The underside of the roof slab shall be finished in the same manner as specified for walls.

One brush or mop coat of hot asphalt roof coating shall be applied to the top surface of the roof slab. The asphalt material shall be heated to within the range specified by the manufacturer and immediately applied to the roof. The finished coat shall be continuous over the roof surface and free from holidays and blisters. Smears and dribbles of asphalt on the roof edges and building walls shall be removed.

**109-3.4 FLOOR.** The floor shall be reinforced concrete as shown in the drawings. When present, all sod, roots, refuse, and other perishable material shall be removed from the area under the floor to a depth of 8 inches (200 mm), unless a greater depth is specified in the invitation for bids. This area shall be backfilled with materials consisting of sand, cinders, gravel, or stone. Fill shall be placed in layers not to exceed 4 inches (100 mm) and shall be thoroughly compacted by tamping or rolling. A layer of building paper shall be placed over the fill prior to placing concrete. The floor surfaces shall have a steel-troweled finish. The floor shall be level unless a drain is specified, in which case the floor shall be pitched 1/4 inch (6 mm) per foot downward toward the drain. A 1/4-inch (6-mm) asphalt felt expansion joint shall be placed between floor and foundation walls. The floor shall be poured monolithically and shall be free of honeycombs and voids.

**109-3.5 FLOOR DRAIN.** If shown in the plans, a floor drain and dry well shall be installed in the center of the floor of the equipment room. The dry well shall be excavated 4 x 4 feet (1.2 x 1.2 m) square and to a depth of 4 feet (1.2 m) below the finished floor elevation and shall be backfilled to the elevation of the underside of the floor with gravel - which shall all pass a 2 inches (50 mm) mesh sieve and shall all be retained on a 1/4 inch (6 mm) mesh sieve. The gravel backfill shall be placed in 6 inch (150 mm) maximum layers, and the entire surface of each layer shall be tamped either with a mechanical tamper or with a hand tamper weighing not less than 25 pounds (11 kg) and having a face area of not more than 36 square inches (232 square cm) nor less than 16 square inches (103 square cm). The drain inlet shall be set flush in the concrete floor. The drain shall have a clear opening of not less than 8 inch (200 mm) in diameter.

**109-3.6 CONDUITS IN FLOOR AND FOUNDATION.** Conduits shall be installed in the floor and through the foundation walls per the details shown in the plans. All underground conduit shall be painted with a bituminous compound. Conduit shall be installed with a coupling or metal conduit adapter flush with the top of the floor. All incoming conduit shall be closed with a pipe plug to prevent the entrance of foreign material during construction. Space conduit entrances shall be left closed.

**109-3.7 DOORS.** Doors shall be metal-clad fireproof Class A (three (3) hour rated) doors conforming to requirements of the National Electrical Code (NEC) and local electrical codes. Panic bar exit hardware shall be installed per NEC requirements. Refer to the new electrical vault detail plan sheets for construction requirements."

**109-3.8 PAINTING.** The floor, ceiling, and inside walls of concrete construction shall first be given a hardening treatment, after which the Contractor shall apply two coats of paint as specified below, except that interior face brick walls need not be painted. The hardening treatment shall consist of applying two coats of either a commercial floor hardener or a solution made by dissolving 2 pounds (0.9 kg) of magnesium fluorosilicate or zinc sulfate crystals in one gallon (liter) of water. Each coat shall be allowed to dry at least 48 hours before the next application. After the second treating coat has dried, the surfaces shall be brushed clean of all crystals and thoroughly washed with clear water. Paint for walls and ceiling shall be a light gray color approved by the Engineer. The floor paint shall be a medium gray color approved by the Engineer. Before painting, the surfaces shall be dry and clean. The first coat shall be thinned by adding 2/3-quart (0.63 liters) of spar varnish and 1/3-quart (0.31 liters) of turpentine to each gallon (liter) of paint. The second coat shall be applied without thinning. All doors, lintels, and windows shall be cleaned to remove any rust or foreign material and shall be given one body and one finish coat of white paint. Bare metal surfaces shall be given a prime coat of corrosion-inhibiting primer prior to the body and finish coats.

**109-3.9 LIGHTS AND SWITCHES.** The Contractor shall furnish and install a minimum of two duplex convenience outlets in the vault room. Where a control room is specified, at least two duplex outlets shall be installed.

#### **INSTALLATION OF EQUIPMENT IN VAULT OR PREFABRICATED METAL HOUSING**

**109-3.10 GENERAL.** The Contractor shall furnish, install, and connect all equipment, equipment accessories, conduit, cables, wires, buses, grounds, and support necessary to ensure a complete and operable electrical distribution center for the airport lighting system as specified herein and shown in the plans. When specified, an emergency power supply and transfer switch shall be provided and installed.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction.

**109-3.11 POWER SUPPLY EQUIPMENT.** Transformers, regulators, booster transformers, and other power supply equipment items shall be furnished and installed at the location shown in the plans or as directed by the Engineer. The power supply equipment shall be set on steel "H" sections, "I" beams, channels, or concrete blocks to provide a minimum space of 1-1/2 inch (38 mm) between the equipment and the floor. The equipment shall be placed so as not to obstruct the oil-sampling plugs of the oil-filled units; and name-plates shall, so far as possible, not be obscured.

If specified in the plans and specifications, equipment for an alternate power source or an emergency power generator shall be furnished and installed. The alternate power supply installation shall include all equipment, accessories, an automatic changeover switch, and all necessary wiring and connections. The emergency power generator set shall be the size and type specified.

**109-3.12 SWITCHGEAR AND PANELS.** Oil switches, fused cutouts, relays, transfer switches, panels, panel boards, and other similar items shall be furnished and installed at the location shown in the plans or as directed by the Engineer. Wall or ceiling mounted items shall be attached to the wall or ceiling with galvanized bolts of not less than 3/8-inch (9 mm) diameter engaging metal expansion shields or anchors in masonry or concrete vaults.

**109-3.13 DUCT AND CONDUIT.** The Contractor shall furnish and install square-type exposed metallic ducts with hinged covers for the control circuits in the vault. These shall be mounted along the walls behind all floor-mounted equipment and immediately below all wall-mounted equipment. The hinged covers shall be placed to open from the front side with the hinges at the front bottom.

Wall brackets for square ducts shall be installed at all joints 2 feet (60 cm) or more apart with intermediate brackets as specified. Conduit shall be used between square ducts and equipment or between different items of equipment when the equipment is designed for conduit connection. When the equipment is not designed for conduit connection, conductors shall enter the square-type control duct through insulating bushings in the duct or on the conduit risers.

**109-3.14 WIRING AND CONNECTIONS.** The Contractor shall make all necessary electrical connections in the vault per the wiring diagrams furnished and as directed by the Engineer. In wiring to the terminal blocks, the Contractor shall leave sufficient extra length on each control lead to make future changes in connections at the terminal block. This shall be accomplished by running each control lead the longest way around the box to the proper terminal. Leads shall be neatly laced in place.

**109-3.15 MARKING AND LABELING.** All equipment, control wires, terminal blocks, etc., shall be tagged, marked, or labeled as specified below:

**a. Wire identification.** The Contractor shall furnish and install self-sticking wire labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks. Wire labels, if used, shall be of the self-sticking preprinted type and of the manufacturer's recommended size for the wire involved. Identification -markings designated in the plans shall be followed. Tags, if used, shall be of fiber not less than 3/4 inch (19 mm) in diameter and not less than 1/32 inch (1 mm) thick. Identification markings designated in the plans shall be stamped on tags by means of small tool dies. Each tag shall be securely tied to the proper wire by a nonmetallic cord.

**b. Labels.** The Contractor shall stencil identifying labels on the cases of regulators, breakers, and distribution and control relay cases with white oil paint as designated by the Engineer. The letters and numerals shall be not less than one inch (25 mm) in height and shall be of proportionate width. The Contractor shall also mark the correct circuit designations per the wiring diagram on the terminal marking strips, which are a part of each terminal block.

## METHOD OF MEASUREMENT

**109-4.1** The quantity of vaults to be paid for under this item shall consist of the number of vaults constructed in place and accepted as a complete unit.

**109-4.2** The quantity of prefabricated metal housings to be paid for under this item shall consist of the number of housings constructed in place and accepted as a complete unit.

**109-4.3** The quantity of vault or prefabricated metal housing equipment to be paid for under this item shall consist of all equipment installed, connected, and accepted as a complete unit ready for operation.

### BASIS OF PAYMENT

**109-5.1** Payment will be made at the contract unit price for each completed and accepted vault or prefabricated metal housing equipment installation. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item L-109a	Vault Building and Foundation, Complete in Place – Lump Sum
Item L109-b	10 KW Regulator and Control Equipment, Complete in Place – Lump Sum

### MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits
AC 150/5345-49	Specification L-854, Radio Control Equipment;
AC 150/5345-53	Airport Lighting Equipment Certification Program
American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)	S-85-625 Standard for Telecommunications Cable Aircore, Polyolefin Insulated, Copper Conductor Technical Requirements
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C62	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C90	Standard Specification for Loadbearing Concrete Masonry Units
ASTM D2823	Standard Specification for Asphalt Roof Coatings, Asbestos Containing
ASTM D4479	Standard Specification for Asphalt Roof Coatings – Asbestos-Free
Commercial Item Description (CID) A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

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FED SPEC W-C-1094	Conduit and Conduit Fittings Plastic, Rigid
IEEE 1584	Guide for Performing Arc-Flash Hazard Calculations
MPI Reference #9	Alkyd, Exterior, Gloss (MPI Gloss Level 6)
SSPC Paint 25 BCS	Zinc Oxide, Alkyd, Linseed Oil, Primer for
Underwriters Laboratories Standard 6	Electrical Rigid Metal Conduit – Steel
NFPA-70	National Electrical Code (NEC)
NFPA-70E	Standard for Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems

**END OF ITEM L-109**

**ITEM L-110**  
**AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS**

**DESCRIPTION**

**110-1.1** This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turbing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

**EQUIPMENT AND MATERIALS**

**110-2.1 GENERAL.**

**a.** All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

**b.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor's cost.

**c.** All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

**d.** The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

**e.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**110-2.2 STEEL CONDUIT.** Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.

**110-2.3 PLASTIC CONDUIT.** Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I—Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.
- c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

**110-2.4 SPLIT CONDUIT.** Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

**110-2.5 CONDUIT SPACERS.** Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

**110-2.6 CONCRETE.** Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 3/4-inch maximum size coarse aggregate with a minimum 28-day compressive strength of 4,000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

**110-2.7 FLOWABLE BACKFILL.** Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.

**110-2.8 DETECTABLE WARNING TAPE.** Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

## CONSTRUCTION METHODS

**110-3.1 GENERAL.** The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint

shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6 mm) sieve. Flowable backfill may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item.

as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

b. Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

**110-3.2 DUCT BANKS.** Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

**110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT.** Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

**110-3.4 MARKERS.** The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

**110-3.5 BACKFILLING FOR CONDUITS.** For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 "Excavation and Embankment" except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

**110-3.6 BACKFILLING FOR DUCT BANKS.** After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one

moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

**110-3.7 RESTORATION.** Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

### METHOD OF MEASUREMENT

**110-4.1** Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

### BASIS OF PAYMENT

**110-5.1** Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110a	Airport Underground Electrical Duct Bank 2-Way 4-Inch PVC (Concrete Encased) – per linear foot
Item L-110b	Airport Underground Electrical Conduit 2-Inch PVC (DEB) (Beacon) – per linear foot
Item L-110c	Airport Underground Electrical Conduit 2-Inch PVC (DEB) (PAPI) – per linear foot

Item L-110d      Airport Underground Electrical Conduit 2-Inch PVC (DEB) (MIRL) – per linear foot

### **MATERIAL REQUIREMENTS**

Advisory Circular (AC) 150/5340-30

Design and Installation Details for Airport Visual Aids

AC 150/5345-53      Airport Lighting Equipment Certification Program

ASTM A615      Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM D1556      Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D1557      Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>(2,700 kN-m/m<sup>3</sup>))

ASTM D2167      Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D2922      Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

NFPA-70      National Electrical Code (NEC)

Underwriters Laboratories Standard 6

Electrical Rigid Metal Conduit - Steel

Underwriters Laboratories Standard 514B

Conduit, Tubing, and Cable Fittings

Underwriters Laboratories Standard 514C

Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

Underwriters Laboratories Standard 1242

Electrical Intermediate Metal Conduit Steel

Underwriters Laboratories Standard 651

Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

Underwriters Laboratories Standard 651A

Type EB and A Rigid PVC Conduit and HDPE Conduit

**END OF ITEM L-110**

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**ITEM L-125**  
**AIRPORT LIGHTING SYSTEMS, GUIDANCE SIGNS AND EDGE MARKERS (NON-LED)**

**DESCRIPTION**

**125-1.1** This item shall consist of airport lighting systems, guidance signs and retroreflective pavement edge markers furnished and installed in accordance with this Specification, the referenced Specifications, and the applicable Advisory Circulars. The systems are to be installed at the location and in accordance with the dimensions, design, and details shown in the Plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the Engineer.

**MATERIALS**

**125-2.1 REFERENCES.**

a. Airport lighting equipment and materials covered by FAA Specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be listed in Advisory Circular 150/5345-53C (current edition), Approved Airport Lighting Equipment.

b. Airport guidance signs and materials covered by FAA specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be in accordance with Advisory Circular 150/5345-44H, Specification for Taxiway and Runway Signs.

c. All other equipment and materials covered by other referenced Specifications shall be subject to acceptance through the manufacturer's certification of compliance with the applicable Specifications.

d. Lists of the equipment and materials required for a particular system are contained in the applicable Advisory Circular.

**125-2.2 TAPE.** Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88, respectively, as manufactured by the Minnesota Mining and Manufacturing Company, or an approved equal.

**125-2.3 CONCRETE.** Concrete shall conform to Specification Item P-610, Structural Portland Cement Concrete.

**125-2.4 LIGHTING CABLE.** See Item L-108 for requirements.

**125-2.5 SPLICES.** See Item L-108 for requirements.

**125-2.6 BASE-MOUNTED EDGE LIGHTS.** Base-mounted edge lights shall meet the requirements of Advisory Circular 150/5345-46D and shall include furnishing and installing L-823 connector kits, L-830 transformers (30/45/100 watt, 6.6/6.6 AMP), L-861 light units, L-867 bases and installation of the light units in the locations shown on the Plans. The runway threshold lights (L-861 SE) require a 100-watt L-830 transformer. Inner lenses are to be 180 degrees red and 180 degrees green. The runway edge lights (L-861) require a 45-watt

transformer. Lenses are to be 360 degrees clear. The taxiway edge lights (L-861T) require a 30-watt transformer. Lenses are to be 360 degrees blue. All L-867, Size B, light bases shall have a 1/2-inch minimum diameter drain hole drilled in the bottom and shall be furnished with factory attached grounding lug on the exterior wall of the base prior to galvanizing. Connect a #6 AWG bare jumper to the ground lug and connect it to a ground rod at each fixture.

**125-2.7 GROUND RODS WITH GROUND ROD CONNECTION.** Grounding electrodes shall be solid copper or copper clad steel rods at least 5/8 inch in diameter by 8 feet long. Grounding clamps shall be high strength, high conductivity, and cast bronze with a screw for wrench driving. Extruded, drawn, or stamped type ground clamps are not acceptable. Ground Rod connection shall be #6 AWG, bare solid copper. Ground rods and connections are incidental to the pay item.

**125-2.8 SPLICE BASE.** This item consists of providing an L-867 Light Base w/Solid Lid and L-823 Connector Kits per the Plans. All L-867, Size D splice bases shall have a 1/2-inch minimum diameter drain hole drilled in the bottom and shall be furnished with factory attached grounding lugs on both the interior and exterior wall of the base prior to galvanizing. Splice bases provided in long cable runs to facilitate pulling cables shall have smooth interior edges at the ends of conduits or shall have bell ends on conduits to prevent scraping damage to cable insulation while pulling.

**125-2.9 LIGHTED GUIDANCE SIGNS.** Internally lighted guidance signs shall be in accordance with FAA Advisory Circular 150/5345-44H. The signs shall be Type L-858Y, R, L, or B, as detailed on the Plans. The size and style shall be as detailed on the Plans. Signs shall be Class 1. Signs shall include all foundation, support, and electrical components as detailed on the Plans and required by AC 150/5345-44H. Where designated to add a sign module adjacent to an existing sign, the new module shall match the brand of the existing sign.

The table shown on the Plans for estimated volt-ampere loads has been used in the circuit design. The sign load volt-amperes (VA) shall not exceed the values shown by more than 15 percent even if the regulator has excess capacity. The total volt-ampere circuit load of signs, lights, and other circuit components shall not exceed the capacity and capability of any constant current regulator. If the Contractor supplies equipment which exceeds the VA or KW capacity of the regulator, the regulator shall be replaced at no cost to the Owner.

**125-2.10 LIGHTED SIGN ISOLATION TRANSFORMERS.** Isolation transformers shall be Type L-830 and be of the proper wattage for each sign's power loading through a series circuit powered by a 3 step L-858 constant current regulator.

**125-2.11 TRUE RMS METER.** A true RMS reading multi-meter shall be provided for sign lamp current adjustment with a protective carrying case, complete instructions and field probe/clamp leads. This unit will become airport property at Project completion and is incidental to the sign unit cost.

**125-2.12 UNLIGHTED GUIDANCE SIGNS.** Unlighted guidance signs shall be in accordance with FAA Advisory Circular 150/5345-44H. The signs shall be Type L-858Y, R, or L (Style 4) as detailed on the Plans. The size shall be as detailed on the Plans. Signs shall be Mode 1. Signs shall include all foundation and support components as detailed on the Plans and required by AC 150/5345-44H.

**125-2.13 MATERIALS CONDITION.** All material shall be in new and unused condition, with the exception of designated relocated and/or salvaged materials. Relocated and/or salvaged materials that are damaged by the Contractor shall be replaced with new materials at no additional cost to the Owner.

**125-2.14 INSTRUCTION GUIDE.** Three instruction guides with sign installation details, maintenance requirements and current adjustment procedures shall be included with each order of signs.

**125-2.15 RETROREFLECTIVE MARKERS.** Retroreflective markers shall be Type L-853 and shall be in accordance with Advisory Circular 150/5345-39C, Type II, blue.

## CONSTRUCTION METHODS

**125-3.1 SCOPE.** Site Work shall include all grading, ground surface preparation, excavation, trenching, and disposal required to completely prepare the job site for installation of structures and cables, and to provide the required surface drainage. All Site Work shall be considered as an incidental cost included in the Unit Price Bid.

**125-3.2 LAYOUT OF WORK.** Work under this Contract will require the Contractor to set his own stakes, marks and reference points for establishment of lines and grades which will be taken from the control grades and lines shown on the Drawings.

**125-3.3 PROTECTION OF EXISTING AIRPORT LIGHTING SYSTEM COMPONENTS.** The Contractor shall be responsible to locate and protect existing system components in the vicinity of the Work. The locations shown on the Project Drawings are general and for information only and do not represent the exact locations of such system components. The Contractor shall be responsible for repair or replacement of any system components damaged by his operations at no additional cost to the Owner.

**125-3.4 GENERAL.** The installation, relocation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow the work schedules established at the Pre-construction Conference. The systems shall be installed in accordance with the National Electrical Code and/or local code requirements. Only complete and properly operational lighting and signage installations or relocations will be accepted.

Note: All lights and signage assemblies shall have frangible (breakable) couplings properly installed.

Caution: The series lighting circuit must always be complete before a regulator is energized. Normal circuit voltage is less than 5,000 volts; open circuit voltage can be more than 10,000 volts. All personnel shall be instructed to protect the integrity of the lighting circuit. The regulator shall be turned off at the vault before opening the circuit. Continuity of the circuit shall be checked before the regulator is reconnected and re-energized.

**125-3.5 EXISTING CIRCUIT CABLE TERMINATIONS.** The Contractor shall positively identify and tag all existing circuit cables exposed and unplugged at light/sign base locations intended for reconnection and circuit continuation and shall be carefully protected, waterproofed and located for reuse.

**125-3.6 LIGHT FIXTURES.** The light fixtures consist of an optical system, lamp, connecting leads, and a mounting assembly. The installer shall assemble, connect to mounting, level and adjust the light fixture in accordance with the manufacturer's instructions. The light fixtures shall be leveled and aligned. The location and elevation of the light fixtures shall be as specified on the Plan details. Edge lights shall be in a straight line parallel to the pavement centerline. They shall be located as specified on the Plans within a tolerance of  $\pm 1/2$  inch. The splice bases shall also be set plumb within a tolerance of  $\pm 1$  degree.

The light fixture must be bonded to the light base internal ground lug via a #6 AWG stranded copper wire rated for 600 volts with green XHHW insulation. The ground wire length must be sufficient to allow the removal of the light fixture from the light base for routine maintenance. See the light fixture manufacturer's instructions for proper methods of attaching a bonding wire.

The lights are to be installed in the paved or unpaved shoulders, and set to provide a uniform light line. Any soil required to be imported or removed shall be considered as incidental to the light installation. The soil shall be graded to drain away from the lights. The soils disturbed around the lights shall be compacted to a density at least equal to the natural undisturbed soil density.

**125-3.7 BASE-MOUNTED LIGHT/SPLICE BASE.** If the soil is unsuitable, then an adequate depth of soil shall be removed and replaced with compacted acceptable material. The drainage rock shall be placed on the prepared subgrade and the base shall be placed, elevated and leveled and be concrete encased as shown on the Plans by pre-casting or field pour.

The Contractor is responsible for the careful and complete salvage of any designated light units. These specified light units with new isolation transformers, shall be relocated on new L-867 bases, set on grade at the locations indicated on the Plans, and the edge lights re-lamped with new lamps.

The Contractor shall level the light base so the frangible coupling is at the elevation required, below the edge of the pavement adjacent to the edge light. With the base properly oriented, duct properly installed, and held at the proper elevation as determined by the Plans; backfill around the outside of the light. The earth shall be compacted at least to the density of undisturbed soil. The finished installation shall be free from depressions that would hold water or bumps, or exposed edges which would damage aircraft tires if one should accidentally hit them.

Prior to mounting the light fixture on the base, L-823 connector kits shall be installed on the primary power cable ends and the appropriate new L-830 isolation transformer is installed. These transformers serve as a means of isolating the unit from the high voltage primary of the series circuit. Wrap the connector joints in the primary circuit with at least 1 layer of rubber or synthetic rubber tape and 1 layer of plastic tape 1/2 lapped extending at least 1-1/2 inches on each side of the joints, as per Item L-108.

After the connector has been installed and taped, the cable insulation shall be cleaned with a wax and grease solvent which will remove the silicone sealing grease from the surface of the cable. A sealant equal to Raychem S-1052 (strips) shall be wrapped around the installation of the cables. Heat shrinkable tubing equal to Raychem MWTM-3612 shall then be slid over the ends of the connector. Heat shall be applied at the center of the connector and spread to the ends to shrink the tubing and melt the sealant to provide a waterproof seal. Excessive heat shall be avoided.

Plug the light disconnecting plug into the transformer secondary receptacle, and secure the transformer plug in the base lid cable clamp. Install the brick under the transformer and away from the base weephole. Then install the baseplate gasket and secure with the provided bolts.

**125-3.8 INTERNALLY LIGHTED GUIDANCE SIGN INSTALLATION.** Each sign shall consist of the panel(s), mounting hardware, light source, wiring, secondary extensions, transformer, light base (L-867), and the concrete base. The concrete base shall be as shown on the Plans. The base shall be reinforced with 6 inch by 6 inch #10 x #10 wire mesh and all edges shall be chamfered.

Any soil required around the sign base shall be compacted and the slope shall not exceed 5 to 1.

The guidance signs shall be powered by the runway and taxiways series circuits.

Signs shall be sealed to prevent blowing rain, snow and dust from entering the sign under the conditions at the Airport where they will be installed.

When replacement sign face panels are required to be furnished and installed in existing signs, the original sign manufacturer shall certify that the retrofit units meet or exceed the original Specifications.

Frangible couplings shall break along the designed line without sharp edges or protruding points. Floor flanges shall not break and anchor bolts shall not pull out before failure of the frangible coupling. The top of the signs shall not wobble or move more than 1 percent of the overall height when pushed by hand.

Signs shall have sections or panels that are removable for relamping and to allow for cleaning the complete interior of the sign. The removable portion shall totally separate from the remainder of the sign.

The sign manufacturer shall provide a 5-year warranty for all electronic components, circuit boards and electrical devices in the sign, excluding lamps. This warranty shall include the replacement parts and delivery of them to the Airport at no cost to the Owner.

All sign lamps shall be of the same type. Approved lamps shall be manufactured by at least 2 sources and shall be readily available from commercial electrical supply dealers.

Paint on the sign shall not peel.

Wiring shall be secured and protected from rubbing and chaffing.

If lamp current or voltage adjustments are to be made, access shall be provided so the Work can be done by 1 person without kneeling or lying down. Screw type adjustments shall include guides and barriers to prevent contact with any live components.

The Contractor shall submit test reports, certified by the manufacturer, stating the electrical characteristics of each sign. The reports shall provide total volt-amperes, watts, power factor, lamp current and voltage for each brightness step (style 2, 4.8, 5.5 and 6.6 amperes).

**125-3.9 UNLIGHTED GUIDANCE SIGN INSTALLATION.** The unlighted signs are to be installed in the paved or unpaved shoulders, set plumb and level to provide a clear sight line.

Any soil required to be imported or removed shall be considered as incidental to the sign installation. The soil shall be graded to drain away from the signs. The soil disturbed around the sign shall be compacted to a density at least equal to the natural undisturbed soil density. If the soil is unsuitable, then an adequate depth of soil shall be removed and replaced with compacted acceptable material. The sign base legs shall have frangible couplings and concrete anchors placed as shown on the Plans.

The Contractor shall level the mounting legs or stakes so that the frangible couplings are at the elevation required below the edge of the pavement adjacent to the sign. With the sign properly oriented and at the proper elevation, earth backfill around the legs or stakes and anchor concrete shall be compacted at least to the density of undisturbed soil. The finished installation shall be free from depressions that would hold water or bumps, or exposed edges that would damage aircraft tires if one should accidentally hit them.

**125-3.10 GROUNDING.** Ground rods shall be attached to the ground wire by grounding clamps. Brazing, welding, or equivalent method such as CADWELD exothermic process or BURNDY THERMOWELD or equivalent for attaching ground wire to ground rods may also be used. Soldered connections shall not be used. Ground wires shall be so connected to provide an electrically continuous grounding for the respective structural unit or assembly. If called for in the Plans a safety ground circuit may also be installed and connected to the ground bus at the airfield lighting vault. The safety ground circuit may be a #6 AWG insulated wire for 600 volts (XHHW). Insulation shall be colored green. Attach the safety ground circuit to the ground lug at each light base or mounting stake, and secure the entire lighting circuit to the ground bus at the vault. The safety ground circuit must be installed in the same duct or conduit as the lighting power conductors. Safety grounds and connections are incidental.

**125-3.11 RETROREFLECTIVE MARKERS.** Retroreflective markers shall be installed plumb and to 24 inches high at the locations shown on the Plans.

**125-3.12 DISPOSAL.** Any excess material from graded areas shall be spread evenly in the areas immediately adjacent to the site in such manner as to maintain proper drainage of the area. All removed concrete bases, trash, deleterious material and other objectionable matter resulting from the construction shall be disposed of properly off the airport.

**125-3.13 RESTORATION.** All areas disturbed by the trenching, storing of dirt, cable laying, pad construction and other shall be restored to its original condition.

## QUALITY ASSURANCE CERTIFICATIONS

**125-4.1 GENERAL.** In order to be eligible for installation under the airport grant program, manufacturers of the type of equipment specified herein are required to certify or furnish proof to the Airport Owner, or the Owner's Representative, that the equipment conforms to the following provisions.

**125-4.2 GUARANTEE.** The manufacturer shall provide the following guarantee: The equipment has been manufactured in accordance with Specifications and any defect in material or workmanship which may occur within 5 years from installation will be corrected or replaced by the manufacturer at no cost to the Owner.

**125-4.3 VISUAL INSPECTION.** The signs shall be examined for compliance with the requirements for legend, dimensions, materials, finish, and quality of workmanship. The signs

shall be viewed in daylight from a distance of 800 ft. The sign type, as defined in Advisory Circular 150/5345-44H, should be readily identifiable. The sign face and reflective material shall appear to be smooth and shall be free of any aberration (excepting minor seams between retroreflective sheets) and sharp edges.

**125-4.4 PRODUCTION TESTING.** All production sign legend panels shall be inspected for compliance with all dimensions described herein. Reflective material shall appear to be smooth and be free of any aberration (except at seams). Panel joints of modular signs shall be observed to ensure that they not interfere with the legibility of the sign.

**125-4.5 ELECTRICAL CONTINUITY.** After installation, all cables shall be tested to demonstrate electrical continuity, freedom from short circuits, and a minimum of 50 megohms resistance between conductors and from each conductor to ground when tested at not less than 500 volts D.C.; unless the cable is rated at a lower voltage.

**125-4.6 OPERATION TEST.** A complete check shall be made of all regulators, wiring, lighting, and lighted signage in the system circuits to assure that all connections are tight, correct, and in full accord with the installation requirements.

With power connections completed, the Contractor shall then demonstrate by operational tests each entire system will operate satisfactorily as specified. With all portions of the system functioning properly, a test run of not less than 4 15-minute cycles shall be made to demonstrate the compliance with Specifications and acceptability of the installation.

The Contractor shall demonstrate to the Engineer, FAA, State Aeronautics representatives, and/or Owner that the equipment is properly adjusted mechanically and electrically, and perform the insulation tests at the time of the acceptance inspection.

**125-4.7 SIGN CURRENT ADJUSTMENT.** With all circuits energized and operating properly after testing procedures have been demonstrated to the satisfaction of the Engineer, proceed to adjust each sign current draw at all 3 intensity settings following the manufacturer's operation instructions using the True RMS Meter.

Signs unable to maintain current adjustments will be "punch listed," and it will be the Contractor's responsibility to coordinate parts replacement expeditiously and perform current adjustments in the presence of the Engineer.

## METHOD OF MEASUREMENT

**125-5.1** The quantity of lights, signs, splice bases, or retroreflective edge markers to be paid for under this item shall be the number of each type installed as completed units in place, ready for operation, and accepted by the Engineer. Double-faced signs shall be counted as 1 sign for payment.

## BASIS OF PAYMENT

**125-6.1** Payment will be made at the Contract Unit Price for each complete light, sign, splice base, or retroreflective edge marker installed by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item, including concrete foundations, mounting legs or stakes,

transformers, splice bases for lighted signs, L-867 bases for lights, grounds, connector kits, and all above-ground wiring.

Payment will be made under:

Item L-125a 24-inch Base-Mounted Medium Intensity Runway Edge Light - per each

Item L-125b 24-inch Base-Mounted Medium Intensity Threshold Light - per each

Item L-125c Lighted Guidance Sign (2 Module) - per each

Item L-125d Lighted Guidance Sign (3 Module) - per each

Item L-125e Splice Base (MIRL)- per each

Item L-125f Splice Base (PAPI / Wind Cone) – per each

Item L-125g Retroreflective Marker – per each

Item L-125h Lighted Guidance Sign (1 Module) – per each

#### **FEDERAL SPECIFICATIONS REFERENCED IN ITEM L-125**

<b>Number</b>	<b>Title</b>
WW-C-581	Conduit, Metal, Rigid; and Coupling; Elbow; and Nipple, Electrical Conduit: Zinc-Coated
W-C-1094	Conduit and Fittings: Non-Metallic Rigid (Plastic)
WW-C-581	Conduit, Metal, Rigid; and Coupling; Elbow; and Nipple, Electrical Conduit: Zinc-Coated
J-C-30	Cable and Wire, Electrical Power, Fixed Installation
HH-I-595	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic, for Low-Temperature Application
AC 150/5340-30D	Design and Installation Details for Airport Visual Aids
AC 150/5345-39C	Specification for L-853 Runway and Taxiway Retroreflective Markers
AC 150/5345-42F	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44H	Specification for Taxiway and Runway Signs
AC 150/5345-46D	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47B	Isolation Transformers for Airport Lighting Systems

AC 150/5345-53C    Approved Airport Lighting Equipment

**END OF ITEM L-125**

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**ITEM L-125**  
**AIRPORT LIGHTING SYSTEMS, GUIDANCE SIGNS AND EDGE MARKERS (LED)**

**DESCRIPTION**

**125-1.1** This item shall consist of airport LED lighting systems, LED guidance signs and retroreflective pavement edge markers furnished and installed in accordance with this Specification, the referenced Specifications, and the applicable Advisory Circulars. The systems are to be installed at the location and in accordance with the dimensions, design, and details shown in the Plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the Engineer.

**MATERIALS**

**125-2.1 REFERENCES**

a. Airport lighting equipment and materials covered by FAA Specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be listed in Advisory Circular 150/5345-53C (current edition), Approved Airport Lighting Equipment.

b. Airport guidance signs and materials covered by FAA specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be in accordance with Advisory Circular 150/5345-44H, Specification for Taxiway and Runway Signs.

c. All other equipment and materials covered by other referenced Specifications shall be subject to acceptance through the manufacturer's certification of compliance with the applicable Specifications.

d. Lists of the equipment and materials required for a particular system are contained in the applicable Advisory Circular.

**125-2.2 TAPE.** Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88, respectively, as manufactured by the Minnesota Mining and Manufacturing Company, or an approved equal.

**125-2.3 CONCRETE.** Concrete shall conform to Specification Item P-610, Structural Portland Cement Concrete.

**125-2.4 LIGHTING CABLE.** See Item L-108 for requirements.

**125-2.5 SPLICES.** See Item L-108 for requirements.

**125-2.6 BASE-MOUNTED EDGE LIGHTS.** Base-mounted LED edge lights shall meet the requirements of Advisory Circular 150/5345-46D and shall include furnishing and installing L-823 connector kits, L-830 transformers (30/45/100 watt, 6.6/6.6 AMP), L-861(L) light units, L-867 bases and installation of the light units in the locations shown on the Plans. The runway threshold lights (L-861 SE(L)) require a 100-watt L-830 transformer. Inner lenses are to be 180 degrees red and 180 degrees green. The runway edge lights (L-861(L)) require a 45-watt

transformer. Lenses are to be 360 degrees clear. The taxiway edge lights (L-861T(L)) require a 30-watt transformer. Lenses are to be 360 degrees blue. All L-867, Size B, light bases shall have a 1/2-inch minimum diameter drain hole drilled in the bottom and shall be furnished with factory attached grounding lug on the exterior wall of the base prior to galvanizing. Connect a #6 AWG bare jumper to the ground lug and connect it to a ground rod at each fixture.

**125-2.7 GROUND RODS WITH GROUND ROD CONNECTION.** Grounding electrodes shall be solid copper or copper clad steel rods at least 5/8 inch in diameter by 8 feet long. Grounding clamps shall be high strength, high conductivity, and cast bronze with a screw for wrench driving. Extruded, drawn, or stamped type ground clamps are not acceptable. Ground Rod connection shall be #6 AWG, bare solid copper. Ground rods and connections are incidental to the pay item.

**125-2.8 SPLICE BASE.** This item consists of providing an L-867 Light Base w/Solid Lid and L-823 Connector Kits per the Plans. All L-867, Size D splice bases shall have a 1/2-inch minimum diameter drain hole drilled in the bottom and shall be furnished with factory attached grounding lugs on both the interior and exterior wall of the base prior to galvanizing. Splice bases provided in long cable runs to facilitate pulling cables shall have smooth interior edges at the ends of conduits or shall have bell ends on conduits to prevent scraping damage to cable insulation while pulling.

**125-2.9 LIGHTED GUIDANCE SIGNS.** Internally lighted guidance signs shall be in accordance with FAA Advisory Circular 150/5345-44H. The LED signs shall be Type L-858Y(L), R, L, or B, as detailed on the Plans. The size and style shall be as detailed on the Plans. Signs shall be Class 1. Signs shall include all foundation, support, and electrical components as detailed on the Plans and required by AC 150/5345-44H. Where designated to add a sign module adjacent to an existing sign, the new module shall match the brand of the existing sign.

The table shown on the Plans for estimated volt-ampere loads has been used in the circuit design. The sign load volt-amperes (VA) shall not exceed the values shown by more than 15 percent even if the regulator has excess capacity. The total volt-ampere circuit load of signs, lights, and other circuit components shall not exceed the capacity and capability of any constant current regulator. If the Contractor supplies equipment which exceeds the VA or KW capacity of the regulator, the regulator shall be replaced at no cost to the Owner.

**125-2.10 LIGHTED SIGN ISOLATION TRANSFORMERS.** Isolation transformers shall be Type L-830 and be of the proper wattage for each sign's power loading through a series circuit powered by a 3 step L-858 constant current regulator.

**125-2.11 TRUE RMS METER.** A true RMS reading multi-meter shall be provided for sign lamp current adjustment with a protective carrying case, complete instructions and field probe/clamp leads. This unit will become airport property at Project completion and is incidental to the sign unit cost.

**125-2.12 UNLIGHTED GUIDANCE SIGNS.** Unlighted guidance signs shall be in accordance with FAA Advisory Circular 150/5345-44H. The signs shall be Type L-858Y, R, or L (Style 4) as detailed on the Plans. The size shall be as detailed on the Plans. Signs shall be Mode 1. Signs shall include all foundation and support components as detailed on the Plans and required by AC 150/5345-44H.

**125-2.13 MATERIALS CONDITION.** All material shall be in new and unused condition, with the exception of designated relocated and/or salvaged materials. Relocated and/or salvaged materials that are damaged by the Contractor shall be replaced with new materials at no additional cost to the Owner.

**125-2.14 INSTRUCTION GUIDE.** Three instruction guides with sign installation details, maintenance requirements and current adjustment procedures shall be included with each order of signs.

**125-2.15 RETROREFLECTIVE MARKERS.** Retroreflective markers shall be Type L-853 and shall be in accordance with Advisory Circular 150/5345-39C, Type II, blue.

## CONSTRUCTION METHODS

**125-3.1 SCOPE.** Site Work shall include all grading, ground surface preparation, excavation, trenching, and disposal required to completely prepare the job site for installation of structures and cables, and to provide the required surface drainage. All Site Work shall be considered as an incidental cost included in the Unit Price Bid.

**125-3.2 LAYOUT OF WORK.** Work under this Contract will require the Contractor to set his own stakes, marks and reference points for establishment of lines and grades which will be taken from the control grades and lines shown on the Drawings.

**125-3.3 PROTECTION OF EXISTING AIRPORT LIGHTING SYSTEM COMPONENTS.** The Contractor shall be responsible to locate and protect existing system components in the vicinity of the Work. The locations shown on the Project Drawings are general and for information only and do not represent the exact locations of such system components. The Contractor shall be responsible for repair or replacement of any system components damaged by his operations at no additional cost to the Owner.

**125-3.4 GENERAL.** The installation, relocation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow the work schedules established at the Pre-construction Conference. The systems shall be installed in accordance with the National Electrical Code and/or local code requirements. Only complete and properly operational lighting and signage installations or relocations will be accepted.

Note: All lights and signage assemblies shall have frangible (breakable) couplings properly installed.

Caution: The series lighting circuit must always be complete before a regulator is energized. Normal circuit voltage is less than 5,000 volts; open circuit voltage can be more than 10,000 volts. All personnel shall be instructed to protect the integrity of the lighting circuit. The regulator shall be turned off at the vault before opening the circuit. Continuity of the circuit shall be checked before the regulator is reconnected and re-energized.

**125-3.5 EXISTING CIRCUIT CABLE TERMINATIONS.** The Contractor shall positively identify and tag all existing circuit cables exposed and unplugged at light/sign base locations intended for reconnection and circuit continuation and shall be carefully protected, waterproofed and located for reuse.

**125-3.6 LIGHT FIXTURES.** The light fixtures consist of an optical system, lamp, connecting leads, and a mounting assembly. The installer shall assemble, connect to mounting, level and adjust the light fixture in accordance with the manufacturer's instructions. The light fixtures shall be leveled and aligned. The location and elevation of the light fixtures shall be as specified on the Plan details. Edge lights shall be in a straight line parallel to the pavement centerline. They shall be located as specified on the Plans within a tolerance of  $\pm 1/2$  inch. The splice bases shall also be set plumb within a tolerance of  $\pm 1$  degree.

The light fixture must be bonded to the light base internal ground lug via a #6 AWG stranded copper wire rated for 600 volts with green XHHW insulation. The ground wire length must be sufficient to allow the removal of the light fixture from the light base for routine maintenance. See the light fixture manufacturer's instructions for proper methods of attaching a bonding wire.

The lights are to be installed in the paved or unpaved shoulders, and set to provide a uniform light line. Any soil required to be imported or removed shall be considered as incidental to the light installation. The soil shall be graded to drain away from the lights. The soils disturbed around the lights shall be compacted to a density at least equal to the natural undisturbed soil density.

**125-3.7 BASE-MOUNTED LIGHT/SPLICE BASE.** If the soil is unsuitable, then an adequate depth of soil shall be removed and replaced with compacted acceptable material. The drainage rock shall be placed on the prepared subgrade and the base shall be placed, elevated and leveled and be concrete encased as shown on the Plans by pre-casting or field pour.

The Contractor is responsible for the careful and complete salvage of any designated light units. These specified light units with new isolation transformers, shall be relocated on new L-867 bases, set on grade at the locations indicated on the Plans, and the edge lights re-lamped with new lamps.

The Contractor shall level the light base so the frangible coupling is at the elevation required, below the edge of the pavement adjacent to the edge light. With the base properly oriented, duct properly installed, and held at the proper elevation as determined by the Plans; backfill around the outside of the light. The earth shall be compacted at least to the density of undisturbed soil. The finished installation shall be free from depressions that would hold water or bumps, or exposed edges which would damage aircraft tires if one should accidentally hit them.

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After the connector has been installed and taped, the cable insulation shall be cleaned with a wax and grease solvent which will remove the silicone sealing grease from the surface of the cable. A sealant equal to Raychem S-1052 (strips) shall be wrapped around the installation of the cables. Heat shrinkable tubing equal to Raychem MWTM-3612 shall then be slid over the ends of the connector. Heat shall be applied at the center of the connector and spread to the ends to shrink the tubing and melt the sealant to provide a waterproof seal. Excessive heat shall be avoided.

Plug the light disconnecting plug into the transformer secondary receptacle, and secure the transformer plug in the base lid cable clamp. Install the brick under the transformer and away from the base weephole. Then install the baseplate gasket and secure with the provided bolts.

**125-3.8 INTERNALLY LIGHTED GUIDANCE SIGN INSTALLATION.** Each sign shall consist of the panel(s), mounting hardware, light source, wiring, secondary extensions, transformer, light base (L-867), and the concrete base. The concrete base shall be as shown on the Plans. The base shall be reinforced with 6 inch by 6 inch #10 x #10 wire mesh and all edges shall be chamfered.

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### QUALITY ASSURANCE CERTIFICATIONS

**125-4.1 GENERAL.** In order to be eligible for installation under the airport grant program, manufacturers of the type of equipment specified herein are required to certify or furnish proof to the Airport Owner, or the Owner's Representative, that the equipment conforms to the following provisions.

**125-4.2 GUARANTEE.** The manufacturer shall provide the following guarantee: The equipment has been manufactured in accordance with Specifications and any defect in material or workmanship which may occur within 5 years from installation will be corrected or replaced by the manufacturer at no cost to the Owner.

**125-4.3 VISUAL INSPECTION.** The signs shall be examined for compliance with the requirements for legend, dimensions, materials, finish, and quality of workmanship. The signs shall be viewed in daylight from a distance of 800 ft. The sign type, as defined in Advisory Circular 150/5345-44H, should be readily identifiable. The sign face and reflective material shall appear to be smooth and shall be free of any aberration (excepting minor seams between retroreflective sheets) and sharp edges.

**125-4.4 PRODUCTION TESTING.** All production sign legend panels shall be inspected for compliance with all dimensions described herein. Reflective material shall appear to be smooth and be free of any aberration (except at seams). Panel joints of modular signs shall be observed to ensure that they not interfere with the legibility of the sign.

**125-4.5 ELECTRICAL CONTINUITY.** After installation, all cables shall be tested to demonstrate electrical continuity, freedom from short circuits, and a minimum of 50 megohms resistance between conductors and from each conductor to ground when tested at not less than 500 volts D.C.; unless the cable is rated at a lower voltage.

**125-4.6 OPERATION TEST.** A complete check shall be made of all regulators, wiring, lighting, and lighted signage in the system circuits to assure that all connections are tight, correct, and in full accord with the installation requirements.

With power connections completed, the Contractor shall then demonstrate by operational tests each entire system will operate satisfactorily as specified. With all portions of the system functioning properly, a test run of not less than 4 15-minute cycles shall be made to demonstrate the compliance with Specifications and acceptability of the installation.

The Contractor shall demonstrate to the Engineer, FAA, State Aeronautics representatives, and/or Owner that the equipment is properly adjusted mechanically and electrically, and perform the insulation tests at the time of the acceptance inspection.

**125-4.7 SIGN CURRENT ADJUSTMENT.** With all circuits energized and operating properly after testing procedures have been demonstrated to the satisfaction of the Engineer, proceed to adjust each sign current draw at all 3 intensity settings following the manufacturer's operation instructions using the True RMS Meter.

Signs unable to maintain current adjustments will be "punch listed," and it will be the Contractor's responsibility to coordinate parts replacement expeditiously and perform current adjustments in the presence of the Engineer.

## METHOD OF MEASUREMENT

**125-5.1** The quantity of lights, signs, splice bases, or retroreflective edge markers to be paid for under this item shall be the number of each type installed as completed units in place, ready for operation, and accepted by the Engineer. Double-faced signs shall be counted as 1 sign for payment.

## BASIS OF PAYMENT

**125-6.1** Payment will be made at the Contract Unit Price for each complete light, sign, splice base, or retroreflective edge marker installed by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation,

assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item, including concrete foundations, mounting legs or stakes, transformers, splice bases for lighted signs, L-867 bases for lights, grounds, connector kits, and all above-ground wiring.

Payment will be made under:

Item L-125a	24-inch (LED) Including Arctic Option, Base-Mounted Medium Intensity Runway Edge Light (L-861) - per each
Item L-125b	24-inch (LED) Including Arctic Option, Base-Mounted Medium Intensity Threshold Light (L-861SE) - per each
Item L-125c	LED Lighted Guidance Sign (2 Module) - per each
Item L-125d	LED Lighted Guidance Sign (3 Module) - per each
Item L-125e	Splice Base (MIRL) - per each
Item L-125f	Splice Base (PAPI / Wind Cone) - per each
Item L-125g	Retroreflective Marker – per each
Item L-125h	LED Lighted Guidance Sign (1 Module) – per each

#### FEDERAL SPECIFICATIONS REFERENCED IN ITEM L-125

Number	Title
WW-C-581	Conduit, Metal, Rigid; and Coupling; Elbow; and Nipple, Electrical Conduit: Zinc-Coated
W-C-1094	Conduit and Fittings: Non-Metallic Rigid (Plastic)
WW-C-581	Conduit, Metal, Rigid; and Coupling; Elbow; and Nipple, Electrical Conduit: Zinc-Coated
J-C-30	Cable and Wire, Electrical Power, Fixed Installation
HH-I-595	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic, for Low-Temperature Application
AC 150/5340-30D	Design and Installation Details for Airport Visual Aids
AC 150/5345-39C	Specification for L-853 Runway and Taxiway Retroreflective Markers
AC 150/5345-42F	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44H	Specification for Taxiway and Runway Signs
AC 150/5345-46D	Specification for Runway and Taxiway Light Fixtures

AC 150/5345-47B Isolation Transformers for Airport Lighting Systems

AC 150/5345-53C Approved Airport Lighting Equipment

**END OF ITEM L-125**

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**ITEM L-132**  
**PRECISION APPROACH PATH INDICATOR (PAPI-2) SYSTEMS**

**DESCRIPTION**

**132-1.1** This item shall consist of installing Precision Approach Path Indicator (PAPI-2) equipment as shown on the Plans.

The installation shall be in accordance with the Plans and Specifications for this Project and/or the manufacturer's instructions. This item includes furnishing and installing the materials for the PAPI's, power frame, associated field equipment, the steel reinforced concrete pads, Power and Control Units (PCU), underground cable and duct between the PAPI units and the Power Control Unit as shown on the Plans and modification of distribution equipment and L821 control panel in the terminal electrical vault. The furnishing and installing materials shall include all materials required to complete the installation to the satisfaction of the Engineer.

The proposed L-881 PAPI system consists of 2 lamp housings and a Power Control Unit (PCU) as well as power frame and equipment at each end of the runway installed at the elevation and location designated in the Plans. Each lamp housing has 2 light projectors. Each housing is aimed at specific angles as shown in the Plan PAPI Siting Detail.

**MATERIALS**

**132-2.1 GENERAL**

a. Airport lighting equipment and materials covered by FAA Specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be listed in Advisory Circular 150/5345-53C (current edition), Approved Airport Lighting Equipment.

b. Airport lighting equipment and materials covered by FAA Specifications shall be subject to acceptance through the manufacturer's certification of compliance with the applicable specifications.

c. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through the manufacturer's certification of compliance with the applicable specifications. Complete material information, i.e. Specifications, model numbers, description, etc., shall be submitted to the Engineer for approval prior to delivery, for all equipment and materials to be furnished.

d. Advisory Circulars for the FAA Specification equipment to be supplied are as follows:

AC 150/5345-26D	Specification for L-823 - Plug and Receptacle, Cable Connectors
AC 150/5345-7E	Specification for L-824 - Underground Electrical Cables for Airport Lighting Circuits
AC 150/5345-42F	Specification for Airport Light Bases, Transformer Housing, Junction Boxes and Accessories

AC 150/5345-28F	Specification for L-881 Precision Approach Path Indicators (PAPI) Systems
AC 150/5345-53C	Approved Airport Lighting Equipment

### 132-2.2 PAPI SYSTEM

TYPE:	L-881 (consists of 2 lighted units with 2 lamps each).
STYLE:	A (Voltage powered system - Multiple Circuit).
CLASS:	II (Systems which operate down to - 55 degrees C).

**132-2.3 LAMP HOUSINGS.** FAA Advisory Circular AC 150/5345-28F contains the complete requirements for the L-881 Precision Approach Path Indicator lamp housings. The runway end and angular setting in degrees must be identified on each housing with a permanently attached laminated plastic marker. All PAPI components shall be manufactured by the same company.

**132-2.4 LAMPS.** New lamps will be provided in each housing in accordance with manufacturer's recommendation. Lamps shall have a minimum rated life of 1,000 hrs.

**132-2.5 TILT SWITCH.** A tilt switch system shall be provided for each of the PAPI boxes. The tilt switch shall meet the requirements of paragraph 6e of AC 150/5345-28F.

**132-2.6 POWER CONTROL UNIT (PCU).** One Power and Control Unit (PCU) is required for each PAPI installation. The PCU unit furnished shall be designed to operate at 220/240 volt (60Hz)  $\pm$  10 percent from a 480V single phase service through a 480-120/240V step-down transformer. An automatic switch is included by the manufacturer in the PCU to reduce the brightness of the lamps during darkness. The PAPI circuit in the PCU unit shall be furnished with lightning arrestors of the gaseous discharge type to protect the equipment unless already equipped by the manufacturer. The PAPI's shall be equipped with interlock relays to allow the PAPI's to operate at night only when the runway edge lights are operating. This interlock shall have no affect on daytime operation.

**132-2.7 AIMING AND MEASURING DEVICE.** One set of calibration, measuring and aiming equipment shall be provided for this Project. This includes a complete instruction book with the information required in AC 150/5345-28F. The manual and equipment shall be given to the Airport Manager. The aiming angle of each unit will be stenciled on the housing.

**132-2.8 SPLICE BASES.** Type L-867 Class IA, Size D, 16 inches in diameter light bases are used as junction boxes for each PAPI installation. The number of hub and cover plates shall be as indicated in the Plans. A drain hole shall be placed in the bottom prior to galvanizing - field drilling of steel bases shall not be permitted. The steel cover plates shall be galvanized and the minimum thickness of cover plate shall be 1/4 inch. Size D splice bases shall be furnished with factory attached grounding lugs on both the interior and exterior walls prior to galvanizing. Nonmetal bases may be used under the PAPI boxes.

**132-2.9 TRANSFORMER.** The transformers for the PAPI power shall be rated at 3 or 5 KVA, 480 - 220/240V step-down with center tap, 115 degrees C temperature rise outdoor type with 2 - 5 percent taps (FCBN) as detailed on the Plans. The 3 KVA transformer on each PAPI power frame will supply 220/240V operating power to the PAPI units. Transformers shall be Square D #3S40F

or approved equal. The 5 KVA transformer at the transclosure building shall boost voltage to 480 volts. Transformer shall be Square D #5S40F or approved equal.

**132-2.10 SAFETY SWITCH.** A safety switch rated at 30 amps, 480 volts, 2 pole, SN, NEMA-3R enclosure with 15 amp FRN-Dual Element fuses is required.

**132-2.11 TAPE.** Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88, respectively, as manufactured by the Minnesota Mining and Manufacturing Company, or approved equal.

**132-2.12 CONCRETE.** All concrete shall meet Item P-610 of these Specifications.

**132-2.13 STRUCTURAL METALS.** All conduits, condulets, and fittings shall be galvanized. All vertical supports and conduits shall include frangible couplings immediately above the concrete columns or base. Electrical conduit shall conform to WW-C-591. Flexible conduit from the base frangible coupling to the PAPI box shall be PVC encased similar and equal to Sealtite.

**132-2.14 POWER FRAME.** The power frame and associated equipment, safety switch and step-down transformer shall be included in the PAPI installation and constructed as detailed on the Plans.

**132-2.15 CONTRACTOR FURNISHED MATERIAL.** The Contractor shall furnish all materials and equipment necessary to achieve Project construction. All materials shall be new and unused condition.

**132-2.16 PAINT.** International orange paint shall be applied to all external unpainted parts of the PAPI installation. The paint shall be top quality and compatible to the material to which it is applied.

**132-2.17 WIRE.** See Item L-108 for requirements.

**132-2.18 REINFORCING STEEL.** Reinforcing steel bars shall be intermediate structural grade deformed-type bars and shall meet the requirements of AASHTO M31.

**132-2.19 DUCT.** See Item L-110.

**132-2.20 TAGGING.** All circuits in lamp housing, handhole bases, CPU units, square duct, etc. must be identified. See Item L-108 for requirements.

**132-2.21 LIGHTING CONTACTORS.** Lighting contactors for control of PAPIs through the L821 Control Panel switch shall be rated 20 amp, 2 pole, shall be electrically held and shall be housed in a NEMA1 enclosure. Contactors shall be Square D Class 8903 Catalog #LC20.

## CONSTRUCTION METHODS

**132-3.1 SCOPE.** Site work shall include grading, ground surface preparation, excavation, trenching and disposal required to completely prepare the job site for installation of structures, cables, and to provide the required surface drainage. All excavation is unclassified and shall be considered as an absorbed cost in the various Work items.

**132-3.2 LAYOUT OF WORK.** Work under this Contract will require the Contractor to set his own stakes, marks and reference points for establishment of lines and grades which will be taken from the lines and grades furnished by the Engineer and on the Drawings.

**132-3.3 CONTRACTOR FURNISHED MATERIAL.** The Contractor shall furnish all materials and equipment necessary to achieve installation of the PAPI systems. All materials furnished by Contractor shall be new.

**132-3.4 SPECIAL PRECAUTIONS FOR WORK AT OPERATING AIRPORTS.** The Contractor shall inform all his personnel that aircraft has the right-of-way at all times. The Contractor shall conform to the rules and regulations of the Airport and shall coordinate his Work schedule with the Resident Inspector to enable him to advise the Airport Manager's office and other local authorities concerned in advance of operations.

**132-3.5 PROTECTION OF EXISTING CABLES AND UTILITIES.** The Contractor shall be responsible to locate and protect existing underground cables and utilities in the vicinity of the Work. The locations shown on the Project Drawings are for information only and do not represent the exact locations of such underground utilities and cables. The Contractor shall be responsible for repair or replacement of any cables damaged by his operations at no additional cost to the Sponsor.

**132-3.6 TRENCHING, BACKFILL AND CABLE INSTALLATION.** Trenching, backfill and cable installation shall conform to Item L-108. The insulated ground wire shall be attached to the interior wall grounding lug of each splice base in the PAPI cable run between the electrical vault and the PAPI power control unit.

**132-3.7 DUCT AND SPLICE BASES.** When shown on the Plans, duct and/or conduit and splice bases shall be installed per Items L-110 and L-125. Splice bases are provided at angle points and spacing to facilitate pulling cables and are not furnished to encourage splices. Cable splices shall be kept to a minimum and installed only where required.

**132-3.8 PAPI LIGHT HOUSING.** The PAPI light units shall be mounted on a concrete pad as shown on the Plans. Each light unit shall be aligned outward into the approach zone on a line parallel to the runway centerline within a tolerance of +/- 1/2 degree. The concrete base elevations shall conform to the requirements of the final grading plan. Spot and drill holes in the concrete pad to accept expansion type anchors for 3/8 inch by 1-1/2 inches long stainless steel machine screws for anchoring the floor flange base plates.

The light units shall be within 1 inch of a horizontal plane and at the elevation designated on the Plans. The front face of each light unit in a bar shall be located on a line perpendicular to the runway centerline 6 inches. The height of the unit above the pad shall be measured and recorded.

**132-3.9 POWER AND CONTROL UNIT (PCU).** The PCU unit shall be mounted on the power frame as shown on the Plans. All necessary support foundations, installation hardware and materials shall be provided.

**132-3.10 FRANGIBLE MOUNTING.** All equipment above grade; including power and tilt switch circuits, PAPI boxes, PCU units, and power frame, must be mounted with frangible couplings. Power and tilt switch circuits introduced to and from the light units must be through leads fitted with factory molded plugs located at or near the breakable coupling break point.

General mounting details are shown on the Plans, but the dimensions may be modified to accommodate equipment actually provided.

**132-3.11 ADJUSTMENT.** After installation of the light housing, the Contractor shall aim the light units to the vertical angle specified on the Drawings utilizing the Contractor furnished aiming device in accordance with the manufacturer's instructions for the equipment installed. The Contractor shall install rigid laminated plastic labels (with 3/4-inch-high letters) showing the runway end and the angular setting of each box on brass tags 1 inch high with 3/4-inch-high lettering on each housing with the aiming angle inscribed or engraved. These tags shall be attached to the housings with sheet metal screws in a conspicuous location as indicated by the Resident Inspector.

**132-3.12 PAINTING.** All unpainted equipment and materials shall be painted international orange utilizing proper prime coats, etc.

**132-3.13 GROUNDING.** Ground rods shall be 3/4-inch diameter by 8 feet (minimum) long copper jacketed steel. Grounding clamps shall be high strength, high conductivity, cast bronze with a screw for wrench driving. Extruded, drawn or stamped type ground clamps are not acceptable. Brazing, welding or equivalent methods such as CADWELD Exothermic process or BURNDY THEMOWELD or equal for attaching ground wire to ground rods may also be used. Soldered connections shall not be used.

Ground electrode conducts shall be #6 AWG, Bare Copper as shown on the Drawings and shall be so connected to provide an electrically continuous ground for the respective structural unit or assembly.

## TESTING

### 132-3.14 ELECTRICAL.

a. After installation, all cables shall be tested to demonstrate electrical continuity, freedom from short circuits, and a minimum of 50 megohms resistance between conductors and from each conductor to ground when tested at not less than 500 volts D.C., applied for 1 minute unless the cable is rated at a lower voltage. See Item L-108 for detailed requirements.

b. A complete check shall be made of all wiring of the system circuits to assure that all connections are tight, correct and in full accord with the installation requirements.

THE PAPI SHALL NOT BE LEFT IN OPERATION UNTIL DIRECTED BY THE ENGINEER.

With the power connection completed, the Contractor shall make the necessary voltage and current adjustments in accordance with the manufacturer's instructions for the equipment installed and shall then demonstrate by operational tests the entire system will operate satisfactorily as specified. With all portions of the system functioning properly, a test run of not less than 8 hours shall be made to demonstrate the compliance with Specifications and acceptability of the installation.

The Contractor shall demonstrate to the Resident Inspector that the equipment is properly adjusted mechanically and electrically, and perform the insulation tests at the time of the acceptance inspection.

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**METHOD OF MEASUREMENT**

**132-4.1** The PAPI installation, power frame and mounted equipment including PAPI-light-units, tilt switch equipment, PCU, concrete pad, conduit and duct, ground rods and wire, above-ground wiring, mounting, lamps, light bases, circuit connections, lighting arrestors, connector kits, splice base at MIRL connection, current sensing relay, installation, calibration and aiming device, and associated appurtenances to be paid for under this item shall consist of all equipment installed, connected, and as complete units ready for operation. Underground cable and duct from the PAPI Control Unit to the terminal electrical vault will be measured and paid for under Items L-108 and L-110. Splice bases in the conduit run from the terminal electrical vault will be measured and paid for under Item L-125. Only 1 aiming and calibration device is to be furnished.

**BASIS OF PAYMENT**

**132-5.1** Payment will be made at the Contract Unit Price for each completed PAPI system installed in place by the Contractor, and accepted by the Engineer. This price shall be full compensation for furnishing all materials, and for all labor, equipment, tools, and incidentals necessary to complete this item. The system at each end of the runway shall be considered one unit.

Payment will be made under:

Item L-132      L-881 Precision Approach Path Indicator, (PAPI-2) System - per each

**END OF ITEM L-132**

## ITEM T-901 SEEDING

### DESCRIPTION

**901-1.1** This item shall consist of soil preparation, seeding the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

### MATERIALS

**901-2.1 SEED.** The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed	Variety	%	Rate of Application lbs. pure live seed/acre
Galleta, Floret	Viva	20%	1.10
Indian Ricegrass	Paloma	20%	1.09
Grama Sideoats	--	20%	0.91
Alkali Sacaton	Salado	20%	0.10
Grama, Blue	Hachita	20%	0.23
TOTAL		100%	3.43

Straw\* 4,000 lb. per acre

\*Shall contain 60 lb. of tackifier/ton of fiber

Seeding shall be performed during the period between June 15 and August 1 or January 1 and May 1 inclusive, unless otherwise approved by the Engineer.

**901-2.2 LIME.** (Deleted)

**901-2.3 FERTILIZER.** (Deleted)

**901-2.4 SOIL FOR REPAIRS.** The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

## CONSTRUCTION METHODS

**901-3.1 ADVANCE PREPARATION AND CLEANUP.** After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches (125 mm) as a result of grading operations and, if immediately prior to seeding, the top 3 inches (75 mm) of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm). Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

### 901-3.2 DRY APPLICATION METHOD.

**a. Liming.** (Deleted)

**b. Fertilizing.** (Deleted)

**c. Seeding.** Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

**d. Rolling.** After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot (60 to 97 kg per meter) of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot (223 to 298 kg per meter) of width for sandy or light soils.

### 901-3.3 WET APPLICATION METHOD.

**a. General.** The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by

using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

**b. Spraying equipment.** The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons (190 liters) over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons (380 liters) per minute at a pressure of 100 lb / sq inches (690 kPa). The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch (16 mm) solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet (6 to 30 m). One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet (15 m) in length shall be provided to which the nozzles may be connected.

**c. Mixtures.** Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds (100 kg) of lime shall be added to and mixed with each 100 gallons (380 liters) of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds (100 kg) of these combined solids shall be added to and mixed with each 100 gallons (380 liters) of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two (2) weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

**d. Spraying.** Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches (75 mm), after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

**901-3.4 MAINTENANCE OF SEEDED AREAS.** The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. A grass stand shall be considered adequate when bare spots are one square foot (0.01 sq m) or less, randomly dispersed, and do not exceed 3% of the area seeded.

### METHOD OF MEASUREMENT

**901-4.1** The quantity of seeding to be paid for shall be the number of units acre (sq m) measured on the ground surface, completed and accepted.

### BASIS OF PAYMENT

**901-5.1** Payment shall be made at the contract unit price per acre (sq m) or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item 901-5.1                      Seeding - per acre

### MATERIAL REQUIREMENTS

ASTM C602                      Standard Specification for Agricultural Liming Materials

ASTM D977	Standard Specification for Emulsified Asphalt
FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural

**END OF ITEM T-901**

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## **SPECIAL PROVISIONS**

### **1. GENERAL.**

Work to be done under this Agreement consists of furnishing all labor, materials, equipment and accessories and performing all operations necessary to complete the Work in accordance with the Drawings and Specifications.

The following "Special Provisions" shall govern in case of any discrepancies in any or all of the following Specifications, and the intent, either expressed or implied in these "Special Provisions", shall govern in the interpretation of the Plans and Specifications.

The Bidder is required to examine carefully the site of the Proposed Work, the Proposal, Plans and Specifications. He shall satisfy himself as to the character, quality and quantities of Work to be performed, materials to be furnished, and as to the requirements of these Specifications. The submission of a Proposal shall be evidence that the Bidder has made such an examination.

### **2. PLANS.**

The Plans governing and controlling the Work and to which reference is made throughout the Technical Specifications and other Contract Documents are those plans prepared by Armstrong Consultants, Inc. entitled "Shiprock Airstrip – Shiprock, New Mexico, AIP Project No. 3-35-0049-005-2017".

### **3. LOCATION.**

Shiprock Airstrip is located in Shiprock, New Mexico.

### **4. INSURANCE.**

The Contractor shall pay for and maintain during the life of this Contract adequate Worker's Compensation Public Liability and Property Damage Insurance. The Contractor is charged with the responsibility for adequate and proper coverage for all his Subcontract operations. Contractor shall furnish to the Sponsor satisfactory proof of carriage of the insurance required. Public Liability Insurance shall in the amount of not less than \$2,000,000.00 for injuries, including accidental death, to any one person, nor less than \$2,000,000.00 on account of any one accident. Property Damage Insurance shall be carried in an amount not less than \$2,000,000.00. Such Liability Insurance shall include completed operation coverage. The Sponsor and the Engineer shall both be named as additional insured on these policies.

### **5. CONTRACT PERIOD.**

The Contractor understands and agrees that it must commence the Work required hereunder on the date stated on the Notice to Proceed as issued by the Sponsor, and that the Contractor must complete the entirety of the Work under all schedules within the Contract Time specified in the Agreement.

### **6. WORK SCHEDULE AND PROJECT PHASING.**

After the Award of Contract and prior to receiving the Notice to Proceed, the Contractor shall submit to the Engineer a Safety Plan Compliance Document (located in Special Provisions 21). The Sponsor reserves the right to request changes in the sequence of Project schedules if such change is required in the interest of safety or airport operation.

Construction shall be phased in a manner to minimize disruption to air traffic operations. Access shall be maintained from the aircraft parking area and the fuel pumps to the runway at all times.

**7. PRE-CONSTRUCTION CONFERENCE.**

After the Notice to Proceed has been issued and prior to commencement of any Work, the Airport Manager as the Sponsor's Representative will meet with the Engineer and the Contractor to discuss the Work in general, including administrative matters, the Contractor's Quality Control Program, accident prevention, and safety; to answer any questions of the Engineer or Contractor; and to resolve any potential problems before the Work commences.

**8. UNDERGROUND UTILITIES.**

All known existing utilities have been depicted on the Plans as accurately as possible. In many cases, exact location, depth, and pipe size and type are not known. The Contractor is responsible for contacting appropriate utility locator services prior to construction.

In the State of New Mexico call: New Mexico One-Call, Inc. (800) 321-2537, [www.nmonecall.org](http://www.nmonecall.org) please notify 2 full business days. Where the Plans call for the Contractor to relocate an existing utility and the affected utility material composition differs from that shown on the Plans, the Contractor shall immediately notify the Engineer.

**9. PERMITS, TAXES & COMPLIANCE WITH LAWS.**

The Contractor shall procure and pay for all permits, taxes, licenses, and bonds necessary for the prosecution of his Work, and/or required by local, State, and Federal regulations, and laws, as pertains particularly to permits and transportation of materials and equipment, or other operations which are not a specific requirement of these Specifications. The Contractor shall give all notices, pay all fees and taxes, and comply with all Federal, State and local laws, ordinances, rules, and regulations, and building and construction codes bearing on the conduct of the Work. Costs of compliance and/or all taxes shall be included in the Unit Prices Bid for each Contract Item.

**10. FIELD OFFICE.**

The Contractor will be required to provide a field office and furnishings as noted in Section 60, Paragraph 5 of the General Provisions.

**11. HAUL ROADS.**

The Contractor shall obtain approval from the Engineer prior to establishing haul roads within the airport property. Once established, the haul roads shall be utilized for all equipment traffic, and the equipment shall not be allowed to stray or wander away from the established routes. The haul roads shall be the responsibility of the Contractor and shall be maintained and kept in good order at all times. Water when required, shall be applied at the locations and in the amounts necessary to minimize dust and dirt in the air operations area. Haul roads across any active runway or taxiway shall be kept clean and in good order at all times. The Contractor shall repair any damage caused by the movement of equipment on any of the haul roads, whether in designated or undesignated areas. After completion of the Project, the Contractor shall be required to regrade any unpaved portions of the haul road and to reseed the area with local native grasses to match the existing conditions of the area. The performance of any Work as specified by this provision, including watering, maintenance, and repair of the haul roads, shall not be

measured and paid for directly, but shall be considered as necessary and incidental to the Work.

**12. TESTING & STAKING.**

**(QC by Contractor and QA by Sponsor)**

The Contractor is responsible for conducting and payment for all quality control testing, survey and staking noted in these Specifications. Acceptance testing will be furnished by an independent testing laboratory that is retained and paid by the Owner. The person responsible for conducting the testing/staking shall be approved by the Engineer. Field test results shall be furnished daily by the Contractor and the independent testing laboratory in written form to the Engineer's Representative on the Project site and shall be submitted weekly by the Contractor and the independent testing laboratory to the Engineer typed on the forms supplied with the Construction Management Plan. Failure to submit written test results daily or typed test results weekly shall be grounds for suspension of Work (but not Contract Time) until the test results are submitted to the Engineer. Any requested testing data and/or surveying notes shall be supplied to the Engineer by the Contractor and the independent testing laboratory at no cost.

**13. AIRPORT SECURITY.**

During the course of the construction operations, the Contractor will be allowed to utilize an agreed upon number of airport accesses as entrances to the construction site. These gates and the associated haul roads shall be designated by the Engineer. The Contractor shall be required to keep these gates and all other temporary gaps in fencing closed during non-construction hours and guarded as necessary during construction hours to protect the runway from stray livestock. Occupants of any vehicles allowed on the airport shall be the responsibility of the Contractor and the Contractor shall control which vehicles are allowed to enter the airport property during construction except for normal airport operations uses.

**14. CLOSURE OF AIR OPERATIONS AREAS.**

Barricades are considered a necessary and incidental part of the work and no separate measurement or payment will be made therefore. The Contractor shall consider the costs and distribute them to the various bid items.

**15. ACCIDENT PREVENTION.**

Precautions shall be exercised at all times for the protection of persons (including employees) and property, and that the safety provisions of applicable laws and of applicable building construction codes shall be observed, and that machinery, equipment, and explosives shall be guarded and all hazards shall be eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law.

**16. EXISTING UNDERGROUND CABLES.**

The Contractor shall attempt to locate the Sponsor's and/or FAA's underground cables prior to construction. Damage to the underground cables by the Contractor will require replacement by the Contractor at no cost to the Sponsor. Any splicing or replacing of damaged cable shall meet current FAA specifications.

**17. UTILITIES.**

Any utilities required by the Contractor for the prosecution of the Work shall be paid for by the Contractor.

**18. STANDARD OF CARE/WARRANTY.**

The Contractor shall perform all of the work required under the Contract Documents, in accordance with the expertise and skill that would be expected of a Contractor, expert in airport construction projects in general, and the Work required under the Contract Documents, in particular. In addition, the Contractor warrants that materials and equipment furnished under the Contract Documents will be of good quality and new, unless otherwise required by the Contract Documents, that the Work will be free from defects not inherent in the Work involved, and that the Work will conform, in all respects, to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective. The Contractor's warranty excludes defects due to abuse not caused by the Contractor, Subcontractors, or other third parties operating under the direction or control of the Contractor, modifications not executed or approved by the Contractor, improper or insufficient maintenance, by the Sponsor, improper operation by the Sponsor, or normal wear and tear under normal usage.

**19. ATTORNEY'S FEES.**

Should either party breach its obligations under the Agreement to be executed between the Contractor and Sponsor, or under any of the other Contract Documents, the breaching party shall be responsible for reimbursing the non-breaching party for all reasonable Attorney's fees and court costs incurred by the non-breaching party in enforcing its rights under the Contractor's agreement or the other Contract Documents.

**20. CONSTRUCTION SAFETY AND PHASING PLAN WITH CONSTRUCTION SAFETY DRAWINGS.**

To follow on next page.

# **SHIPROCK AIRSTRIP**

Shiprock, New Mexico

## **CONSTRUCTION SAFETY AND PHASING PLAN**

### **SCHEDULE I**

Reconstruct Runway 2/20 and Connector Taxiway A

### **SCHEDULE II**

Runway 2/20 Airfield Lighting and Signage(INCANDESCENT)

### **SCHEDULE II ALTERNATE**

Runway 2/20 Airfield Lighting and Signage (LED)

AIP No. 3-35-0049-005-2017

NMDOT No. 5V5-17-04

ACI No. 176437

June 2017



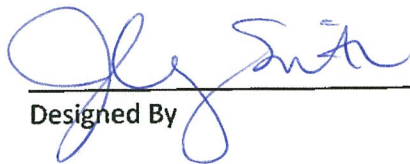
**ARMSTRONG**

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Albuquerque, NM 87106  
O: 505.508.2192 F: 505.508.2795  
[www.armstrongconsultants.com](http://www.armstrongconsultants.com)

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**SPONSOR CONCURRENCE**

The Navajo Nation has read and agreed to this Construction Safety and Phasing Plan.

 4/6/17  
Designed By Date

**SPONSOR APPROVAL:**

 4/6/17  
Sponsor Representative Date

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**SHIPROCK AIRSTRIP**  
**AIP # 3-35-0049-005-2017**

The Contractor shall prepare a detailed Safety Plan Compliance Document (SPCD) as stated in the Advisory Circular 150-5370-2F. The SPCD should include a general statement by the Contractor that he/she has read and will abide by the Construction Safety and Phasing Plan (CSPP). In addition, the Contractor's SPCD shall identify specific methods, sequencing, and phasing that he/she intends to use in order to accomplish the project work. The final SPCD shall be the result of a coordinated effort between the Owner/Sponsor, the Engineer, and the Contractor.

The Contractor shall adhere to the approved SPCD and Construction Safety and Phasing Plan (CSPP) as agreed upon by the Owner/Sponsor, Engineer, and Contractor. Modifications or deviations from the approved safety plan shall be submitted to the Engineer for review and approval prior to implementation. The Engineer for this project is Armstrong Consultants, Inc. The Project Manager is Jacquie Smith, (505) 508-2192.

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## **1.0 COORDINATION**

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A pre-construction meeting will be held prior to the Contractor beginning work or staging material and equipment on-site. The Sponsor, the Contractor, and the Engineer representatives shall be present. The pre-construction meeting will discuss operational safety during construction as a priority.

No closures will be permitted without the applicable Notices to Airmen (NOTAM) in place for each specific closure. Emergency access for both Aircraft Rescue and Fire Fighting (ARFF) and off-airport (Police, Fire, and EMT) based emergency service shall be maintained at all times. Routing for such traffic shall be determined and made known to all supervisor personnel involved in the construction project. Coordination of this access will be proposed by the Contractor and approved by the Engineer or Inspector and the Airport Operations Manager.

### **1.1 Contractor Progress Meetings**

The location and time of the daily progress meetings will be determined during the pre-construction meeting. A continual review of the Contractor's adherence to the CSPP will be made by the Engineer or Inspector and Airport personnel and will be discussed at each meeting. The Contractor will be notified and required to immediately correct any deficiencies that may occur.

### **1.2 Scope or Schedule Changes**

Any changes to the CSPP shall be pre-coordinated with the FAA Airports Regional or District Office of any proposed changes to this CSPP prior to implementation of the change.

All parties involved will need to evaluate the impact(s) of the change and will determine what measures will need to be taken to maintain a safe construction site. Changes in the scope or duration of the project may necessitate revisions to the CSPP.

### **1.3 FAA ATO Coordination**

The FAA Air Traffic Organization (ATO) will need to be notified immediately of any changes that affect aircraft movement within the airport which include facility shutdowns and restarts. The Sponsor will be responsible for coordinating any changes, including NOTAMS, to the FAA ATO. It is not anticipated that any shutdown to FAA facilities will be required for this project.

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## 2.0 PHASING

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In order to minimize disruptions to airport operations during construction, construction will be sequenced in phases to limit the amount of aircraft operations affected at any given time. The phasing plan was developed with help from the Airport and is considered to be the most effective way of maintaining the required aircraft access, while imposing the least amount of impact on Contractor operations, and without sacrificing safety. The phasing for this project is presented below, and is visually depicted in the CSPP Drawings attached in Appendix A.

This project will be completed in two schedules with one phase. Each of the phases is discussed in further detail in the drawings.

### 2.1 Phasing Elements

#### 2.1.1 Phase 1 - Schedule I and Schedule II

This project will be completed in two schedules with one phase. The work for Schedule I and II shall be performed concurrently. Runway 2/20, Connector Taxiway A, and the entire airstrip will be closed for the entire project. Phase one will include all construction activities related to the Reconstruction of Runway 2/20 and Connector Taxiway A. Work will include removing the existing pavement section and constructing a new pavement section of subgrade, base course, and bituminous asphalt pavement. An incandescent medium intensity runway edge light (MIRL) system will be bid in a separate schedule, Schedule II. The MIRL system will require new circuit and regulator in a new airstrip electrical vault. A schedule II alternate will be included in the bid for a LED MIRL system. Schedule I and Schedule II will both be completed within phase one of the project.

The Contractor shall notify the Engineer at least 72 hours prior to any activities within the Airport Operations Area (AOA) so the Airport can provide the any required NOTAM's.

Phase one shall be sixty (60) Calendar Days, the duration of the project. The airport will remain closed for the duration of the project.

## **2.2 Construction Safety and Phasing Plan Drawings**

The CSPP Drawings (Appendix A) of this document show the affected areas and associated closures. When closure is necessary, the Contractor shall obtain approval from the Sponsor and be required to place yellow closure crosses as shown on the plans. Low profile aviation barricades shall be placed to delineate the construction area on taxiways. The drawings have been reviewed, accepted, and signed by the Sponsor.

### 3.0 AREAS AND OPERATIONS AFFECTED BY THE CONSTRUCTION ACTIVITY

All work within the AOA shall be accomplished in conformance with Advisory Circular 150/5370-2F, *Operational Safety on Airports during Construction*. The CSPP Drawings (Appendix A) include information regarding requirements for operational safety on the Airport during construction.

<b>Project</b>	Reconstruct Runway 2/20 and Connector Taxiway A	
<b>Scope of Work</b>	Correct RSA grading deficiencies, reconstruct runway and taxiway pavement sections, and install new airfield lighting, signage and NAVAIDs	
<b>Operational Requirements</b>	Normal (Existing)	Post Construction (Anticipated)
<b>Runway 2/20 Average Aircraft Operations</b>	Carrier: 0 /day GA: 1 / day Military: 0 / day	Carrier: 0 /day GA: 1 / day Military: 0 / day
<b>Runway 2/20 ARC</b>	B-II	B-II
<b>Runway 2 Approach Visibility Minimums</b>	Visual	Visual
<b>Runway 20 Approach Visibility Minimums</b>	Visual	Visual
<b>Runway 2 Approach Procedures</b>	None	None
<b>Runway 20 Approach Procedures</b>	None	None
<b>Taxiway A TDG</b>	2	2
<b>ATCT (hours open)</b>	NA	NA
<b>ARFF Index</b>	NA	NA

<b>RUNWAY</b>	<b>AIRCRAFT APPROACH CATEGORY A, B, C OR D</b>	<b>AIRPLANE DESIGN GROUP I, II, III OR IV</b>	<b>RSA WIDTH IN FEET DIVIDED BY 2</b>
2	B	II	75 Feet
20	B	II	75 Feet

RUNWAY END NUMBER	RSA Length Beyond RWY End	RSA Length Prior to Landing Threshold	Minimum Distance to Threshold based on Required Approach Slope	
2	300 Feet	300 Feet	200 Feet	20:1
20	300 Feet	300 Feet	200 Feet	20:1

### 3.1 Identification of Affected Areas

All of the work for this project will occur within the AOA. The CSPP Drawings (Appendix A) depict the limits of the project and their proximity to the AOA. The Contractor shall not perform construction in the AOA until a NOTAM has been issued to close the airport.

#### 3.1.1 Closing or Partial Closing of Runways, Taxiways and Aprons

Runway 2/20 and Connector Taxiway A will remain closed for the duration of the project.

### 3.2 Mitigation of Effects

To mitigate construction effects on airport operations, a detailed phasing requirement will be specified in the plans and specifications. In developing the phasing requirement, alternative routes allowing emergency and ARFF vehicles and aircraft taxiway and runway movements have been considered.

With the majority of construction taking place within the AOA, phasing will be designed to minimize impacts on airport operations.

It is imperative to adhere to the requirements established in the CSPP Drawings (Appendix A) to maintain safety and operations at the airport during construction. It is important that all involved personnel discuss current and upcoming phases during the required daily updates.

#### 3.2.1 Temporary Changes to Runway and / or Taxi Operations

Runway 2/20 and connector Taxiway A will remain closed for the duration of the project. Aircraft operations are not permitted during construction.

#### 3.2.2 Detours for ARFF and Other Airport Vehicles

There are currently no ARFF operations at the airport. Access to the airport must be maintained for emergency services.

### **3.2.3 Temporary Changes to Air Traffic Control Procedures**

None.

### **3.2.4 Runway Closure Procedure for Night Work**

Night work will not be required for this project.

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## **4.0 NAVIGATION AIDS (NAVAIDS) PROTECTION.**

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No NAVAIDS will be impacted by construction.

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## **5.0 CONTRACTOR ACCESS**

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### **5.1 Location of Stock Piled Construction Materials**

All stock piled materials shall be located in the contractor's staging area. See Construction Safety Plan for location. See Section 16 for discussion on hazard marking and lighting devices requirements. See Section 6 Wildlife Management for discussion on wildlife issues. See Section 7 Foreign Object Debris (FOD) Management for discussion on FOD control.

### **5.2 Vehicle and Pedestrian Operations**

The Contractor will be required to gain access to the airfield for this project. The approved haul route and staging area are shown in the CSPP Drawings (Appendix A). Pedestrians and personal vehicles will not be allowed to leave the staging area.

### **5.3 Construction Site Parking**

Construction site parking will be outside of the AOA and designated areas per the CSPP Drawings (Appendix A).

### **5.4 Construction Equipment Parking**

Construction equipment parking will be allowed at the contractor's staging area in the location shown on the CSPP Drawings (Appendix A) or at a location approved by the Engineer or Inspector. No equipment or material shall be parked or stored in any active runway or taxiway safety area or object free area.

### **5.5 Access and Haul Roads**

During the course of the construction operations, the Contractor will be allowed to utilize an access security gate as entrance to the airfield and construction site. This gate and the haul route to the site are shown on the CSPP Drawings (Appendix A).

The gate may be opened only for authorized vehicles required for Contractor operations. Passengers in any authorized vehicles shall be the responsibility of the Contractor. Haul route designation on Airport property shall be the responsibility of the Airport and its representatives. Once established, the haul roads shall be utilized for all equipment traffic, and the equipment shall not be allowed to stray or wander away from the established routes. The haul roads shall be the responsibility of the Contractor and shall be maintained and kept in good order at all times. When required, water shall be applied at the locations

and in the amounts necessary to minimize dust and dirt in the AOA. Since construction operations will be within active AOA, the Airport will require additional dust control measures be used on haul roads and the work area in order not to interfere with Airport operations. The Contractor shall be prepared at all times to repair any damage caused by the movement of equipment on any of the haul roads at the direction of the Engineer, whether in designated or undesignated areas. After completion of the project, the Contractor shall be required to regrade any unpaved portions of the haul road and to reseed the area with local native grasses to match the existing conditions of the area. The performance of any work as specified by this provision, including watering, maintenance, and repair of the haul roads, shall not be measured and paid for directly, but shall be considered as necessary and incidental to the work. Establishment of haul roads off of Airport property shall be the sole responsibility of the Contractor.

Contractor movement shall be restricted to the predetermined access routes as shown on CSPP Drawings (Appendix A) and within the work area. Work areas shall be delineated with barricades as shown on the CSPP Drawings (Appendix A). The Contractor shall not operate outside of these areas without approval of the Resident Engineer or Inspector. The Airport reserves the right to immediately remove any operator who does not comply with this section on a temporary basis, or at the Airport's discretion, permanently.

## **5.6 Marking and Lighting of Vehicles**

All vehicles operating within the AOA and in the movement areas must clearly identify themselves for control purposes. The identification symbols should be a minimum 8-inch block-type characters of a contrasting color and easy to read. They may be applied either by using tape or a water-soluble paint to facilitate removal. Magnetic signs are also acceptable. All authorized vehicles and construction equipment must display a three-foot by three-foot flag with international orange and white 12-inch squares displayed in full view above the vehicles or a rotating and/or flashing beacon. To operate in those areas, the vehicle must have a flag (day only) or beacon (day or night) attached to it. Any vehicle operation on the movement areas during hours of darkness or reduced visibility must be equipped with a beacon. All lighting of vehicles must comply with FAA AC 150/5210-5, *Painting, Marking and Lighting of Vehicles Used on an Airport*.

## **5.7 Required Escorts**

Escort privileges will not be required for this project. The Contractor is advised to operate with caution on the airfield the duration of the project.

## **5.8 Training Requirements of Vehicle Drivers**

Drivers are not required to attend and pass an airport driving class for this project. This training is typically required for all personnel that would be required to either be badged or plan on operating a vehicle in the AOA. Proper vehicle operations are described as confirming to all rules and regulation for driving as directed by the Airport.

## **5.9 Situational Awareness**

When on the AOA, vehicle drivers must confirm by personal observation that no aircraft is approaching their position either in the air or on the ground when given clearance to cross a runway, taxiway, or any other area open to aircraft operations. The Contractor shall be aware of boundaries to AOA at all times.

## **5.10 Maintenance of the Secured Area of the Airport**

Airport operators and contractors must take care to maintain security during construction when access points are created in the security fencing to permit the passage of construction vehicles or personnel.

Because the Airport is subject to 49 CFR Part 1542, *Airport Security*, even during construction, the Airport must meet standards for access control, movement of ground vehicles, and identification of construction contractor and tenant personnel.

## **5.11 Two-way Radio Communication Procedures**

The Contractor's superintendent shall be required to monitor transceiver radios tuned to the Shiprock Airstrip's Ground frequency 122.9 MHz at all times.

The Contractor shall supply aviation radios. Radios shall be used to obtain proper clearance in regards to the movement of equipment, trucks, etc., within the movement area.

Additionally, any unusual occurrences in the flight pattern of approaching or departing aircraft shall be acknowledged by all concerned so that operation of the airport and the construction work can be safely carried on at all times.

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## **6.0 WILDLIFE MANAGEMENT**

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In general, the Contractor must carefully control and continuously remove waste or excess material that might attract wildlife. Should the Contractor encounter any wildlife on the airfield, he should notify the Sponsor immediately so that appropriate actions to mitigate the problem can be implemented. The Contractor should contact the Sponsor for further guidance regarding any issues or questions regarding wildlife on the airport.

### **6.1 Trash**

The Contractor is responsible for completing a daily inspection of the construction site, including the Contractor's Staging Area, for any trash or objects that might attract wildlife. All trash found shall be disposed of properly.

### **6.2 Standing Water**

Because standing water can attract wildlife, the Contractor is responsible to complete a daily inspection of the construction site for any standing water. At discretion of the Inspector, the Contractor shall promptly remove any standing water.

### **6.3 Tall Grass and Seeds**

All disturbed areas will be re-seeded and hydraulic mulch applied.

### **6.4 Poorly Maintained Fencing and Gates**

The Contractor shall be required to maintain all fences and gates throughout the duration of the project, to the satisfaction of the Airport Operations Manager and Engineer or Inspector.

### **6.5 Disruption of Existing Wildlife Habitat**

The Contractor shall notify the Engineer or Inspector and Airport Operations Manager when any wildlife is sited within the AOA.

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## **7.0 FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT**

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All excavated material, debris, etc. shall be cleaned from the site at least on a daily basis and more often if required by the Sponsor or Engineer. To control dust and/or blowing debris, any soil, debris or loose material shall immediately be swept up and removed. The Contractor shall ensure that the construction site is clean and FOD is not an issue for safe usage of the airport.

The Contractor is required to keep all areas within the construction site free from FOD at all times. The Contractor is required to maintain FOD control continually to the satisfaction of the Inspector. Prior to opening any pavement to aircraft, the Contractor shall conduct a sweep of the pavement to verify that it is FOD free.

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## **8.0 HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT**

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At the preconstruction meeting, the Contractor shall discuss the fueling operation for all equipment on site. Contractors operating construction vehicles and equipment on the Airport must be prepared to expeditiously contain spills resulting from fuel or hydraulic fluid leaks and immediately report to Airport Operations. Any spills that occur on site shall be brought to the attention of the Sponsor immediately. The Contractor shall also notify the Sponsor of any and all required remedial work required and follow appropriate methods for cleaning up the contaminate site. The Contractor shall also make sure the Sponsor is in attendance to witness the cleanup and provide written documentation to the Sponsor stating the remedial work is complete verifying regulation requirements are met. Spill prevention and response procedures for airport owned facilities including regular visual inspections, adopting good housekeeping practices, and reducing and reusing process materials to minimize waste generation on site. The Contractor should provide the Sponsor a list of all materials being delivered to the construction area and maintain MSDS sheets for such materials on the airport site. The Contractor will also be required to verify that NPDES permits requirements are met. The Contractor shall be responsible for any costs and/or mitigation associated with any spills and/or leaks. Material Safety Data Sheets (MSDS) are required for all hazardous materials used on Airport property.

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## 9.0 NOTIFICATION OF CONSTRUCTION ACTIVITIES

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The Contractor shall list the names of individuals that will be responsible for specific items on the construction site. The names shall be given to the Sponsor, as well as posted on a bulletin board on the project. There is 911 emergency service at the Airport which shall be posted on the bulletin board. The following are contacts and names that need to be identified:

### 9.1 Maintenance of a List of Responsible Representatives / Points of Contact

Office/Testing Address and Phone Numbers:

Company Name:

Company Address:

City, State Zip

Ph.: 000-000-0000

Fax: 000-000-0000

Project Superintendent:\_\_\_\_\_

Cell Phone:\_\_\_\_\_

Superintendent:\_\_\_\_\_

Cell Phone:\_\_\_\_\_

24-Hour Contact:\_\_\_\_\_

Cell Phone:\_\_\_\_\_

Safety Officer:\_\_\_\_\_

Cell Phone:\_\_\_\_\_

Quality Control Officer:\_\_\_\_\_

Cell Phone:\_\_\_\_\_

Job Site Environmental Officer:\_\_\_\_\_

Cell Phone:\_\_\_\_\_

Subcontractor information shall be available to the Sponsor and Engineer.

Agency Contact	Type of Agency	Telephone No.
Muriel Plummer	Navajo Nation Department of Transportation	(505) 371-8460
Jacque Smith	Armstrong Consultants, Inc.	(505) 508-2192

## **9.2 Notices to Airmen (NOTAM)**

Only the Airport Operations Manager, Navajo Department of Transportation, or the Navajo Nation may initiate or cancel NOTAMs on airport conditions, and is the only entity that can close or open a runway. The Airport Operations Manager must coordinate the issuance, maintenance, and cancellation of NOTAMs about airport conditions resulting from construction activities and must provide information on closed or hazardous conditions on airport movement areas to the FAA Flight Service Station (FSS) so it can issue a NOTAM. The Contractor must notify the Engineer or Inspector and Airport Operations Manager when scheduling/scoping for the project has changed that would require a modification to the NOTAMs.

## **9.3 Emergency Notification Procedures**

In an event of an emergency, the Contractor shall notify the Engineer or Inspector and Airport Operations Manager immediately and, when necessary, call 911. The Contractor must coordinate after hours contact procedures with the Airport prior to construction.

## **9.4 Coordinate with Airport Rescue and Fire Fighting (ARFF) Personnel**

There are currently no ARFF facilities located on airport property. This project shall not require any deactivation of water lines or fire hydrants, rerouting or blocking of any emergency access routes, or the use of any hazardous material on the airfield that would require coordination with ARFF personnel or emergency services. However, in the event that the Contractor must coordinate construction activities with ARFF Personnel, the Contractor will notify the Airport. The Airport Operations Manager and Inspector, or designated representative, will be responsible for notifying emergency Personnel.

## **9.5 Notification to the FAA**

**Part 77:** Any person proposing construction or alteration of objects that affect navigable airspace, as defined in Part 77, must notify the FAA. This includes construction equipment, stockpiles, and proposed parking areas for this equipment.

Any person proposing construction or alteration of objects that affect navigable airspace, as defined in Part 77, must notify the FAA. This includes construction equipment and proposed parking areas for this equipment. In regards to NAVAIDS damage, the Airport shall contact 1-866-432-2622.

## **10.0 INSPECTION REQUIREMENTS.**

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The Contractor will identify a Safety Officer who will be required to inspect on a daily basis, all barricades and flashers prior to work commencing and prior to leaving the work site. The Contractor will notify the Sponsor that all inspections have been completed. The Contractor shall determine if there is a need to increase the inspections based on the project and site conditions. There will be no decrease in the amount of required inspections. At the project final inspection, the project site shall be clean and free of all debris related to the project construction.

### **10.1 Daily (Or More Frequent Inspections)**

Inspections shall be conducted daily, or more frequently if deemed necessary by the Inspector to ensure conformance with this document. The inspections shall be completed by the Contractor to the Engineer's satisfaction and the Contractor shall submit a copy of all the completed checklists to the Engineer. The Contractor should fill out this checklist every day that construction operations occur on this project. Checklist is provided in Appendix B of this document.

### **10.2 Final Inspections**

Final inspections shall be conducted prior to opening of any airfield facilities. The final inspection should be completed with the Contractor, Airport Operations Manager, Sponsor, Engineer, and Inspector.

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## 11.0 UNDERGROUND UTILITIES

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The Contractor shall be responsible for contacting appropriate utility locator services prior to construction. The Contractor shall attempt to locate the Sponsor's and/or FAA's underground cables prior to construction. Damage to underground cables by the Contractor will require replacement by the Contractor at no cost to the Sponsor and/or FAA. Any splicing or replacing of damaged cable shall meet current FAA specifications. Damage caused to any underground utility through Contractor's negligence shall be repaired according to the relevant utility's standards and at no cost to the Sponsor.

If essential utilities or underground infrastructure is damaged by the Contractor during construction operations, the Contractor shall repair the item as quickly as possible. The Contractor shall notify the Engineer or Inspector about deactivated utilities, the Engineer or Inspector will then notify the Airport's Representative about items impacting Emergency Personnel. The Airport's Representative will then contact the Personnel who are responsible to make the necessary adjustments for the airport.

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## 12.0 PENALTIES

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If at any point a safety violation is noted, all construction activities in the area of the violation will be immediately terminated. Before construction can begin, the Contractor will provide a written statement demonstrating to the Owner that the construction can once again occur without violations to the Safety procedures. The Contractor is not eligible for additional compensation for the down time or any other claim when construction is terminated due to safety violations.

The Airport Operations Manager can suspend construction activities at any time during which they note safety violations. The duty of the Engineer or Owner to conduct construction review of the Contractor's performance is not intended to include review of adequacy of the Contractor's safety measures, in, or near the construction site. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions on the job site including safety of all persons and property during performance of the work. This requirement shall apply continuously and will not be limited to working hours.

Penalties are based on the Airport's security policies. The Contractor is responsible for any penalties that the Airport may distribute.

The rules and procedures as set forth in this guide are enforceable by designated airport officials, law enforcement officials, and TSA officials. Violations of the procedures are considered as violations of the approved Airport Security Program.

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## 13.0 SPECIAL CONDITIONS

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The Contractor shall monitor any weather conditions, aircraft emergencies, unexpected emergencies, and other elements that may cause safety on the project to be jeopardized.

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## **14.0 RUNWAY AND TAXIWAY VISUAL AIDS**

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The Contractor shall notify the Sponsor prior to the runway closure. The Contractor will be required to install runway closure crosses prior to beginning work on the project. Following completion of the project, the Contractor shall notify the Airport Operations Manager and remove the closure crosses.

The Airport Manager and the Contractor's Superintendent shall develop and oversee the lock-out/tag-out plan per 29 CFR Part 1910 Occupational Safety and Health Standards. Low profile barricades shall be installed on the taxiways and apron to delineate the construction areas prior to work being performed. The contractor must verify that construction and closure areas are clearly marked and remain visible for the duration of construction.

### **14.1 General**

During the project, Runway 2/20 and Connector Taxiway A will be closed. The Contractor will need to install approved lighted, low-profile barricades, and Lighted Runway Closure Markers in accordance with the project plans. All must be secured in place to prevent movement by jet blast, prop wash or other wind currents.

### **14.2 Markings**

The procedure to close off the runway or taxiway for construction shall consist of placing barricades and flashers on the perimeter of the construction area. The runway closure markers, as shown in the plans, shall be in place whenever Runway 2/20 is closed. No temporary painted markings are required for this project.

### **14.3 Lighting and Visual NAVAIDS**

There are no lighting and visual NAVAIDS currently on this airport.

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## 15.0 MARKING AND SIGNS FOR ACCESS ROUTES

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Haul routes and other activities on the airport by the Contractor, subcontractors, and Engineer shall be coordinated with and approved in advance by the Airport Manager or his authorized agent. Any traffic signs and markings to delineate the haul route shall meet Advisory Circular 150/5340-18, *Standard for Airport Sign Systems*, Advisory Circular 150/5340-1L, *Standards for Airport Markings*, or the Manual on Uniform Traffic Control Devices (MUTCD) standards, including but not limited to the frangible and height requirements.

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## **16.0 HAZARD MARKING AND LIGHTING**

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### **16.1 Purpose**

The hazard marking and lighting prevents pilots from entering areas closed to aircraft and prevents construction personnel from entering areas open to aircraft. Prior to construction on or adjacent to any runway or taxiway, the Contractor shall, upon approval by the Engineer, close the runway or taxiway and begin work. The Contractor shall be responsible for clearly marking and defining the closed runways and taxiways by use of warning lights, barricades, flags and closed runway or taxiway markings. In addition, the Contractor is required to properly mark and light any open manholes, open trenches, excavations, small areas under repair, stockpiled material, waste areas, and any other areas associated with construction. Contractor shall be responsible for maintaining these barricades and keeping them clearly visible at all times.

### **16.2 Equipment**

Low profile barricades with the MUTCD standard reflective orange and white marking with the 20" min x 20" min flags mounted on the center of the barricade will be used to delineate the construction site. The barricades shall also be required to have the flashing red caution lights. Lights shall be placed on the barricades and spaced at no more than 10 ft. The barricades shall be weighed against propwash and capable of withstanding up to 100 MPH wind forces.

Flashing red caution lights shall maintain such intensity so as to be readily identified from distances of at least 200 feet during darkness. Lights must be operated between sunset and sunrise and during periods of low visibility whenever the airport is open for operations. They may be operated by photocell, but this may require that the Contractor turn them on manually during daytime periods of low visibility. The Contractor shall have a 24-hour on call representative for emergency maintenance of airport hazard lighting and barricades. Solar powered lights are highly encouraged to minimize battery replacement.

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## 17.0 PROTECTION

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The Contractor shall be required to close Runway 2/20 during work within the Runway Obstacle Free Zone (ROFZ). Taxiway A shall be closed during work within the vicinity of the Taxiway Object Free Area (TOFA). Safety areas impacted by construction shall be delineated.

### 17.1 Runway Safety Area (RSA)

The Airport defines the safety area for Runway 2/20 as the area that is within 75 feet from the centerline of Runway 2/20 and extends 300 feet beyond both ends of the runway. While Runway 2/20 is open, work in the safety area is prohibited. When Runway 2/20 is closed for construction, access will be allowed. The RSA and associated dimensions are shown on the CSPP Drawings (Appendix A).

The Airport defines the Safety Area for all runways as the area that is within 75 feet from the centerline of each runway. Construction operations for this project shall not impede into the RSA. During the construction process, construction personnel must not enter into any active RSA unless a NOTAM has been issued to properly close the runway.

It is recommended that the Contractor place markers such as survey lath or construction flagging 10 feet outside of the adjusted RSA to make the area easily identifiable and to ensure that no construction personnel enter the RSA. The Contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

Soil erosion must be controlled to maintain RSA standards. The RSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations. It must be capable under dry conditions of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the heaviest aircraft operating on the runway.

### 17.2 Runway Object Free Area (ROFA)

The Airport defines the object free area for Runway 2/20 as the area that is within 250 feet from the centerline of Runway 2/20 and extends 300 feet beyond both ends of the runway. The ROFA and associated dimensions are shown on the CSPP Drawings (Appendix A). Construction is allowed within the ROFA; however, equipment shall not be left in the ROFA when not in use. Materials are not to be

stockpiled in the ROFA. Construction personnel shall not enter active ROFAs unless required by the project phasing and approved by the Airport.

### **17.3 Taxiway Safety Area (TSA)**

The Airport defines the Safety Area for Taxiway A and the connector taxiways as the area that is within 39.5 feet from the centerline of each taxiway. Construction will be prohibited within any active TSA during operational hours. Because the vicinity of the construction project is within the Runway 2/20 complex, the construction operations will impact the TSA for Taxiway A and Connector Taxiway A. Construction activity, phased closures, and TSA with associated dimensions are shown on the CSPP Drawings (Appendix A).

The Airport defines the Safety Area for all taxiways as the area that is within 39.5 feet from the centerline of each taxiway. Construction operations for this project shall not impede into the TSA. During the construction process, construction personnel must not enter into any active TSA until a NOTAM has been issued to close the airport.

Open trenches and excavations are not permitted within the TSA while the taxiway is open. If possible, backfill any trenches before the taxiway is opened. If the taxiway must be opened before excavations are backfilled, cover the excavations appropriately.

The Contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

Soil erosion must be controlled to maintain TSA standards, that is, the TSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the heaviest aircraft operating on the taxiway.

### **17.4 Taxiway Object Free Area (TOFA)**

The Airport defines the Object Free Area for the taxiway system as the area that is within 65.5 feet from the centerline of each taxiway. The TOFA and associated dimensions are shown on CSPP Drawings (Appendix A). No construction may occur within the TOFA while the taxiway is open for aircraft operations.

Signs, embankments, and equipment within the TOFA must comply with the frangible requirements as stated in Advisory Circular 150/5220-23, *Frangible Connections*.

Construction personnel shall not enter active TOFAs unless required by the project phasing and approved by the Airport.

### **17.5 Obstacle Free Zone (OFZ)**

The Airport defines the OFZ for Runway 2/20 as the area that is within 200 feet from the centerline of Runway 2/20 and extends 250 feet beyond both ends of the runway. Personnel, material, and/or equipment may not penetrate the OFZ while the runway is open for aircraft operations. Because the vicinity of the construction project is within the Runway 2/20 complex, the construction operations will impact the OFZ for Runway 2/20.

Construction operations for this project shall not impede into the OFZ. Construction activity, phase closures, and OFZ with associated dimensions are shown on CSPP Drawings (Appendix A).

### **17.6 Runway Approach/Departure Surfaces**

The existing Part 77 approach surface area for Runway 2 begins 200' from the threshold of the runway and extends away from the runway at a slope of 20:1 for the first 10,000 feet. The width of the approach surface closest to the runway threshold is 800 feet wide and 3,800 feet wide at the furthest end.

The existing approach surface area for Runway 20 begins 200' from the displaced threshold of the runway and extends away from the runway at a slope of 20:1 for 10,000 feet. The width of the approach surface closest to the runway threshold is 800 feet wide and 3,800 feet wide at the furthest end.

The existing departure surface area begins at the threshold of Runway 2 and extends away from the runway at a 40:1 slope for 10,200 feet. The width of the departure surface at the runway threshold is 1,000 feet wide and 6,466 feet wide at the furthest end.

The existing departure surface area begins at the threshold of Runway 20 and extends away from the runway at a 40:1 slope for 10,200 feet. The width of the departure surface at the runway threshold is 1,000 feet wide and 6,466 feet wide at the furthest end.

All personnel, materials, and/or equipment must remain clear of the applicable threshold sitting surfaces. Objects that do not penetrate these surfaces may still be obstructions to air navigation and may affect

standard instrument approach procedures. Construction activity in a runway approach/departure area may result in the need to close a runway or displace the existing runway threshold. All work that is anticipated to be completed within this area shall be coordinated with the Airport and the Engineer.

## **18.0 OTHER LIMITATIONS ON CONSTRUCTION**

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### **18.1 Prohibitions**

The use of open flame welding or torches is prohibited unless adequate fire safety precautions are provided and the airport operator has approved their use. The use of flare pots (open flame for use as an edge light) within the AOA is prohibited at all times. The use of explosives is prohibited on or within 1,000 feet of the airport property, unless expressly authorized by the Sponsor and associated jurisdictions.

### **18.2 Restrictions**

Construction suspension may be required during specific airport operations. Project areas may be worked on simultaneously only if approved by the Engineer and Airport Operations. Night construction may only be performed if approved by the Engineer and Airport Operations.

Construction operations shall only be allowed in weather conditions compliant with the project specifications.

Additional restrictions are placed on tall construction equipment. Typically, any piece of equipment over 20' tall will need to be evaluated to determine its potential impact to the airspace. For this project, there are restrictions on the height and the location of the asphalt plant and the construction crane required to erect and dismantle the plant. Refer to the CSPP for additional information.

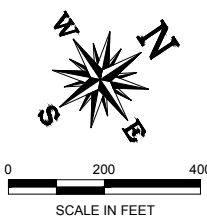
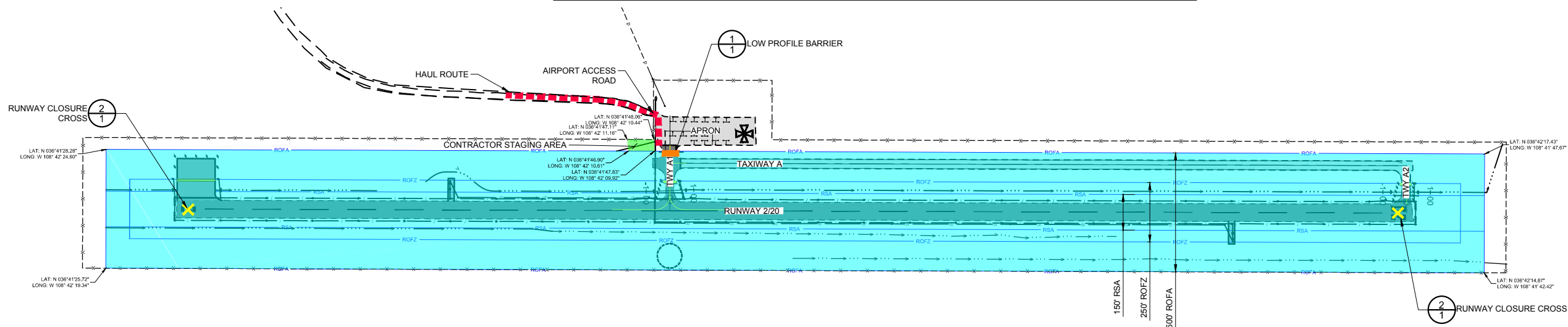


# **APPENDIX A**

## **CSPP DRAWINGS**



AIRPORT WILL BE CLOSED DURING CONSTRUCTION

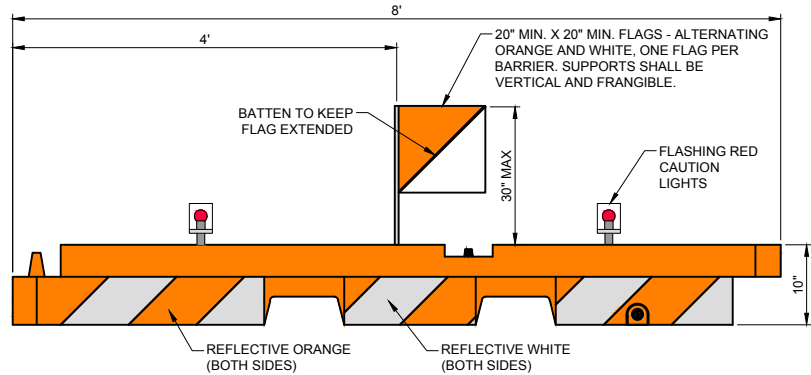


PLAN

LEGEND

- PHASE I WORK AREA
- CONTRACTOR STAGING AREA
- LOW PROFILE BARRIER
- CONTRACTOR HAUL ROUTE
- DETAIL #
- SHEET #
- ROFA = RUNWAY OBJECT FREE AREA
- ROFZ = RUNWAY OBSTACLE FREE ZONE
- RSA = RUNWAY SAFETY AREA
- TOFA = TAXIWAY OBJECT FREE AREA
- TSA = TAXIWAY SAFETY AREA

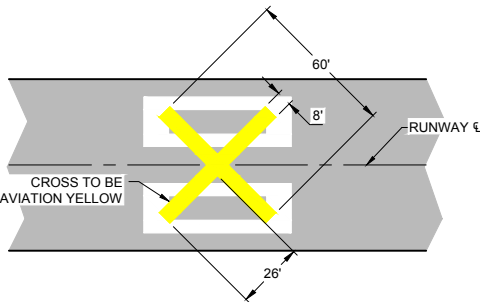
LATITUDE AND LONGITUDES (LAT/LONG) DELINEATION OF THE CONSTRUCTION AREA AND CONTRACTOR STAGING AREA LIMITS



1 LOW PROFILE SAFETY BARRIER  
1 NOT TO SCALE

NOTES:

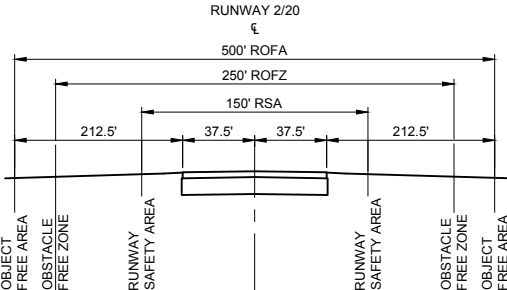
- BARRIER SHALL BE SHERWIN INDUSTRIES, 10" x 96" LOW PROFILE AIRPORT BARRIER, AS SHOWN, OR APPROVED EQUAL.
- THE ENTIRE AREA OF ORANGE AND WHITE STRIPES SHALL BE REFLECTORIZED WITH SMOOTH SURFACE TYPE REFLECTIVE SHEETING.
- LIGHTS MUST BE MOUNTED ON BARRIERS AND SPACED AT NO MORE THAN 10 FT.
- THE BARRIERS SHALL BE WEIGHTED AGAINST PROWASH AND CAPABLE OF WITHSTANDING UP TO 100 M.P.H. WIND FORCES.
- FLASHING RED CAUTION LIGHTS SHALL BE BATTERY OPERATED AND SHALL MAINTAIN SUCH INTENSITY SO AS TO BE READILY IDENTIFIED FROM DISTANCES OF AT LEAST 200 FEET DURING DARKNESS.
- THE CONTRACTOR SHALL CHECK ALL BARRIERS AND LIGHTS EACH DAY BEFORE LEAVING THE AIRPORT TO ENSURE LIGHTS ARE WORKING PROPERLY AND MAY NOT LEAVE WITHOUT ALL BARRIERS AND LIGHTS BEING IN PROPER WORKING ORDER.



2 RUNWAY CLOSURE CROSS  
1 NOT TO SCALE

NOTE:

2 EACH REQUIRED PER CLOSED RUNWAY- INCIDENTAL. TO BE APPLIED OVER RUNWAY NUMERALS ON RUNWAY OR AT RUNWAY ENDS PRIOR TO RUNWAY CLOSURE. CROSSES TO BE CONSTRUCTED OF PLYWOOD OR OTHER FLAT MATERIALS WHICH SHALL BE SECURELY FASTENED TO PAVEMENT AND/OR ADEQUATELY WEIGHTED WITH SAND BAGS.



ALL STATIONARY CONSTRUCTION EQUIPMENT AND STOCKPILES MUST REMAIN CLEAR OF ANY OPEN RUNWAY OBJECT FREE AREA. ALL CONSTRUCTION EQUIPMENT AND TRAFFIC MUST REMAIN CLEAR OF ANY OPEN RUNWAY OBSTACLE FREE ZONE.

3 SAFETY AREAS  
1 NOT TO SCALE

No.	Revision	Date	By

Project No: 166301  
Date: 06/2017  
File Name: 166301150

Drawn: BKR  
Checked: JLS  
Approved: TJA



# **APPENDIX B**

## **CHECKLIST**



## APPENDIX F. CHECKLIST FOR FAA CSPP REVIEW

This checklist provides the Project Manager (PM) and the Airport Certification Safety Inspector (ACSI) a useful tool reviewing a Sponsor's CSPP for conformance to the standards present within AC 150/5370-2. A completed CSPP checklist is not a required grant document.

For project funded under the AIP and PFC programs, the FAA Project Manager's issuance of an approval or non-approval letter represents the **official documentation** that the FAA has conducted a review of CSPP that confirms conformance to the requirements of AC 150/5370-2. The completion of this checklist is not a required AIP or PFC record.

**F.1. Checklist for FAA CSPP Review**Airport Name: Shiprock AirstripLOCID: 5V5Associate City: Navajo NationProject No. 3-35-0049-005-2017**F.1.1 AC 150-5370-2F**

This checklist identifies the main elements and sub-elements established under Section 2, Chapter 2 of Advisory Circular 150/5370-2F. Project Managers (PM) are encouraged to use this checklist as an aid when reviewing a Sponsor's CSPP for conformance to the safety standards. Because the PM's approval/disapproval letter represents the official FAA action, a completed checklist is not a required record the PM must sign or archive in the grant file.

CSPP Element	Element Addressed			Remarks
	Yes	No	N/A	
Coordination (Section 205)				
– Contractor Progress Meetings	X			
– Addresses necessary actions when changes are proposed to CSPP	X			
– Provisions for FAA ATO Coordination	X			
Phasing (Section 206)				
– Phasing Elements	X			
– Construction Safety Drawings	X			
Areas and Operations Affected by Construction Activity (Section 207)				
– Identification of affected Areas	X			
– Mitigation Affects	X			
Navigation Aid Protection (Section 208)				
– Operation NAVAID Critical Areas	X			
Contractor Access (Section 209)				
– Location of Stockpiles Construction Material	X			
– Vehicle and Pedestrian Operations	X			
Wildlife Management (Section 210)				
– Trash	X			
– Standing Water	X			
– Tall Grass	X			
– Fencing and Gates	X			
– Disruption of Wildlife Habitat	X			
Foreign Object Debris (Section 211)				
– FOD Control Measures	X			
Hazardous Material Management (Section 212)				
– Hazardous Material Controls	X			
Notification of Construction Activities (Section 213)				
– List of Responsible Representatives	X			
– NOTAMs	X			
– Emergency Notification Procedures	X			

– Coordination with ARFF	X			
– Notification to the FAA (Part 77, NAVAIDS....)	X			
<b>Inspection Requirements (Section 214)</b>				
– Contractor Progress Meetings	X			
– Addresses necessary actions when changes are proposed to CSPP	X			
– Provisions for FAA ATO Coordination	X			
<b>Coordination (Section 205)</b>				
– Contractor Progress Meetings	X			
– Addresses necessary actions when changes are proposed to CSPP	X			
– Provisions for FAA ATO Coordination	X			



**22. CONSTRUCTION MANAGEMENT PLAN.**

At the Pre-Construction Conference, the Contractor will be given copies of the Construction Management Plan for this Project which will identify the various individuals along with their authority and responsibilities for quality control. That document will detail the measures and procedures to be followed to comply with the Quality Control Provision of the Construction Contract, including, but not limited to the quality control and acceptance tests required by the Project Specifications. The following pages include the Acceptance Testing Checklist and the forms which shall be used by the Contractor and the Independent Testing Laboratory to report test results to the Engineer. The checklist and forms will also be included in the Construction Management Plan when it is prepared for this Project.

**23. STORMWATER DISCHARGE PERMIT.**

The Contractor shall secure and maintain a General Permit for Storm Water Discharges from Construction Sites for this project in accordance with Section 402(p) of the Federal Clean Water Act and Section 405 of the Federal Water Quality Act of 1987. A Notice of Intent shall be filed by the Contractor.

EPA Stormwater Notice Processing Center  
Mail Code 4203M  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue N.W.  
Washington, DC 20460

Copies of the Notice of Intent requirements and required forms are enclosed in the following pages for the use of the Contractor. Electronic filing is available through the EPA website at <http://cfpub1.epa.gov/npdes/stormwater/cgp.cfm>.

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## 21. SAFETY PLAN COMPLIANCE DOCUMENT

I, \_\_\_\_\_ (Name), (CONTRACTOR), have read the Shiprock Airstrip, AIP Project No. 3-35-0049-005-2017 Construction Safety and Phasing Plan (CSPP), approved on \_\_\_\_\_, 2017, and will abide by it as written and with the following additions as noted:

Notes:

1. *If no supplemental information is necessary for any specific section, write "NO SUPPLEMENTAL INFORMATION"*
2. *Do not duplicate information in the CSPP.*

1. **COORDINATION** – Discuss details of proposed safety meetings with the airport operator and with contractor employees and subcontractors

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2. **PHASING** – Discuss proposed construction schedule elements including:

- a. Duration of each phase
- b. Daily start and finish of construction, including "night only" operation
- c. Duration of construction activities during:
  - i. Normal runway operations
  - ii. Closed runway operations
  - iii. Modified runway "Aircraft Reference Code" usage

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3. **AREAS AND OPERATIONS AFFECTED BY THE CONSTRUCTION ACTIVITY** – Areas and operations are identified in the CSPP

NO SUPPLEMENTAL INFORMATION

**4. PROTECTION OF NAVAIDS** – Discuss specific methods proposed to protect operating NAVAIDS

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**5. CONTRACTOR ACCESS** – Provide the following:

- a. Details on how the integrity of the airport security fence will be maintained (gate guards, daily log of construction personnel, or other
- b. List individuals required for driver training (as required)
- c. Radio communications
  - i. Types of radios and backup capabilities
  - ii. Who will be monitoring radios
  - iii. Whom to contact if ATCT cannot reach the contractor's designated person by radio
- d. Details on how material delivery vehicles will be escorted on site

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**6. WILDLIFE MANAGEMENT** – Discuss the following:

- a. Methods and procedures to prevent wildlife attraction
- b. Wildlife reporting procedures

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**7. FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT** – Discuss equipment and methods for controlling FOD, including construction debris and dust

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**8. HAZARDOUS MATERIAL (HAZMAT) MANAGEMENT** – Discuss equipment and methods for responding to hazardous spills

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**9. NOTIFICATION OF CONSTRUCTION ACTIVITIES** – Provide the following:

- a. Contractor points of contact
- b. Contractor emergency contact
- c. Listing of tall or other requested equipment proposed for use on the airport and the timeframe
- d. Batch plant details

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**10. INSPECTION REQUIREMENTS** – Discuss daily (or more frequent) inspections and special inspection procedures

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**11. UNDERGROUND UTILITIES** – Discuss proposed methods of identifying and protecting underground utilities

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**12. PENALTIES** – Penalties are identified in the CSPP

NO SUPPLEMENTAL INFORMATION

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**13. SPECIAL CONDITIONS** – Discuss proposed actions for each special condition identified in the CSPP

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**14. RUNWAY AND TAXIWAY VISUAL AIDS** – Discuss proposed visual aids (marking, lighting, signs, and visual NAVAIDs) including the following:

- a. Equipment and methods for covering signage and airfield lights
  - b. Equipment and methods for temporary closure markings (paint, fabric, other)
  - c. Types of temporary Visual Guidance Slope Indicators (VGSI)
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**15. MARKING AND SIGNS FOR ACCESS ROUTES** – Discuss proposed methods of demarcating access routes for vehicle drivers

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**16. HAZARD MARKING AND LIGHTING** – Discuss proposed equipment and methods for identifying excavation areas

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**17. PROTECTION OF RUNWAY AND TAXIWAY SAFETY AREAS** – Discuss proposed methods of identifying, demarcating, and protecting airport surfaces (safety areas, object free areas, obstacle free zones, and approach/departure zones) including:

- a. Equipment and method for maintaining Runway or Taxiway Safety Area standards

- b. Equipment and methods for separation of construction operations from aircraft operations, including details of barricades.

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**18. OTHER LIMITATIONS ON CONSTRUCTION** – Other limitations (if any) shall be identified in the CSPP

NO SUPPLEMENTAL INFORMATION

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This Safety Plan Compliance Document (SPCD) must be submitted and approved by the Sponsor prior to issuing the Notice to Proceed for Construction. The contractor should allow at least two weeks for review by the Sponsor.

(CONTRACTOR) certifies that it understands the operational safety requirements of the CSPP and will not deviate from the approved CSPP and this SPCD unless written approval is granted by the Sponsor. It is our understanding that upon review and approval of this SPCD, we may request issuance of Notice to Proceed.

By \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
Title Date

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U.S. Department  
of Transportation

Federal Aviation  
Administration

# Advisory Circular

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**Subject:** Painting, Marking, and Lighting of  
Vehicles Used on an Airport

**Date:** April 1, 2010

**AC No:** AC 150/5210-5D

**Initiated by:** AAS-100

**Change:**

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1. **PURPOSE.** This advisory circular (AC) provides guidance, specifications, and standards for painting, marking, and lighting of vehicles operating in the airport air operations area (AOA). The approved lights, colors, and markings herein assure the conspicuity of vehicles operating in the AOA from both the ground and the air.

2. **CANCELLATION.** This AC cancels AC 150/5210-5C, Painting, Marking, and Lighting of Vehicles Used on an Airport, dated August 31, 2007.

3. **APPLICATION.** The Federal Aviation Administration (FAA) recommends the guidelines and standards in this Advisory Circular for vehicles operating in the airport AOA. In general, use of this AC is not mandatory. *However*, use of this AC is mandatory for vehicles funded with federal grant monies through the Airport Improvement Program (AIP) and/or with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assurance No. 34, "Policies, Standards, and Specifications," and PFC Assurance No. 9, "Standard and Specifications."

Vehicles covered by this AC that do not meet this standard may be used until the vehicle is repainted or replaced, but no later than **December 31, 2010**.

4. **PRINCIPAL CHANGES.** This AC contains new specifications and recommendations for the painting, marking, and lighting of Towbarless Tow Vehicles (TLTVs).

5. **METRIC UNITS.** To promote an orderly transition to metric units, this AC includes both English and metric dimensions. The metric conversions may not be exact equivalents, and until there is an official changeover to the metric system, the English dimensions will govern.

6. **COMMENTS OR SUGGESTIONS** for improvements to this AC should be sent to:

Manager, Airport Engineering Division  
Federal Aviation Administration  
ATTN: AAS-100  
800 Independence Avenue, S.W.  
Washington, DC 20591

Michael J. O'Donnell  
Director of Airport Safety and Standards

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## **PAINTING, MARKING, AND LIGHTING OF VEHICLES USED ON AN AIRPORT**

### **1. SOURCES OF APPLICABLE DOCUMENTS.**

- a.** American National Standards Institute, Inc. (ANSI), 25 West 43rd St. 4<sup>th</sup> Floor, New York, NY 10036. Website: **[www.ansi.org](http://www.ansi.org)**
- b.** American Society for Testing & Materials (ASTM), ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. Website: **[www.astm.org](http://www.astm.org)**
- c.** The National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, Massachusetts 02169-7471. Website: **[www.nfpa.org](http://www.nfpa.org)**
- d.** The U. S. General Services Administration (GSA), Centralized Mailing List Services, 501 West Felix Street, Whse 9, South End P.O. Box 6477, Fort Worth, Texas 76115-6477. Website: **[www.gsa.gov](http://www.gsa.gov)**
- e.** The Superintendent of Documents, U.S. Government Printing Office, 732 North Capitol St. NW, Washington, DC 20401.
- f.** Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001. Website: **[www.sae.org](http://www.sae.org)**
- g.** FAA Advisory Circulars: U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75<sup>th</sup> Ave., Landover, MD 20785. Website: **[www.faa.gov](http://www.faa.gov)**
- h.** FAA Engineering Briefs: **[www.faa.gov/airports/engineering/engineering\\_briefs/](http://www.faa.gov/airports/engineering/engineering_briefs/)**

### **2. DEFINITIONS.** The following definitions apply in this AC:

- a. Vehicle** – All conveyances, except aircraft, used on the ground to transport persons, cargo, equipment or those required to perform maintenance, construction, service, and security duties.
- b. Air Operations Area (AOA)** – The portion of airport that encompasses the landing, take off, taxiing, and parking areas for aircraft.
- c. Airport Emergency Vehicles** – Vehicles that are authorized in the AOA for emergency purposes (e.g., ambulances, aircraft rescue and fire fighting (ARFF) vehicles and emergency response vehicles) as authorized by the airport traffic control tower (ATCT) or an authorized on-site accident/incident commander.
- d. Airport Operations Vehicles** – Vehicles routinely used by airport operations personnel for airport inspection and duties associated with airfield operations (such as airfield condition reporting and Incident Command) on the AOA and Movement Area.
- e. Airport Security Vehicles** – Vehicles that are authorized in the AOA for security purposes, as needed (e.g. police cars).

- f. Airfield Service Vehicles** – Vehicles that are routinely used in the AOA for airfield service, maintenance, or construction (e.g. snow blowers, snowplows, maintenance trucks, and tractors).
- g. Aircraft Support Vehicles** – Vehicles that are routinely used in the AOA to support aircraft operations (e.g. aircraft pushback tractors, baggage/cargo tractors or trucks, air conditioning and aviation fuel trucks). These vehicles are typically owned by airlines, vendors, or contractors and are not eligible for Federal funding.
- h. Reduced Visibility** – Prevailing visibility is less than one statute mile (1609 meters) and/or the runway visual range (RVR) is less than 6,000 feet (1830 meters).
- i. Movement Area** – The runways, taxiways, and other areas of an airport/heliport that are used for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with an operating airport traffic control tower (ATCT), specific approval for entry onto the movement area must be obtained from air traffic control (ATC).
- j. Other Vehicles** – Vehicles that are not routinely authorized in the AOA (e.g. construction vehicles). These vehicles are typically owned by airlines, vendors, or contractors and are not eligible for Federal funding.
- k. Peak Intensity** – Peak intensity, for purposes of this document, means the maximum magnitude of luminescence as measured in candela.
- l. Towbarless Tow Vehicle (TLTV)** – a type of aircraft support vehicle whose main purpose is to tow aircraft in the AOA by way of nose gear capture.

### 3. VEHICLE PAINTING.

**NOTE:** *Airport vehicle paint and markings are a safety of flight requirement. The approved colors/markings herein assure conspicuity of vehicles operating in the AOA from both the ground and air.*

#### **a. Airport Emergency Vehicles.**

**(1) Ambulances.** Ambulance vehicles are painted per the most current version of Federal Specification KKK-A-1822, *Federal Specification for the Star-of-Life Ambulance*. Ambulances are not considered vehicles routinely operating on the AOA.

**(2) Aircraft Rescue and Fire Fighting (ARFF) Vehicles.** Yellowish-green is the vehicle color standard. Color specifications are per Appendix A.

**NOTE:** *A yellowish-green color provides optimum visibility during all light levels encountered during a 24-hour day and under variations of light that result from weather and seasonal changes.*

**b. Airport Operations Vehicles.** Airport operations vehicles may be painted in colors designated by the airport operator. The characteristics must be coordinated with the respective ATCT and identified in the tower letter of agreement.

**c. Airport Security Vehicles.** Comply with specific state or local requirements.

**d. Airfield Service Vehicles.** Chrome yellow is the vehicle color standard. Color specifications are per Appendix A. When vehicles are equipped with bumper bars 8 inches (200 mm) or more in depth, the bars must be painted in alternate stripes 4 inches (100 mm) in width of chrome yellow and black inclined 45° to the vertical.

**e. Aircraft Support Vehicles.**

(1) Any color or combination of colors other than yellowish-green or chrome yellow. The bumper bar paint scheme in paragraph 3.d (of alternating chrome yellow and black stripe) is recommended.

(2) **TLTVs.** International orange is the vehicle color standard. Retroreflective tape covering more than 25 percent of the vehicle's vertical surfaces may be used as a temporary measure to meet this standard prior to scheduled vehicle painting.

**f. Other Vehicles.** Any color or combination of colors other than solid black or white.

#### 4. VEHICLE MARKING.

**a. Airport Emergency Vehicles.**

(1) **Ambulances.** Ambulances are marked per the most current version of Federal Specification KKK-A-1822.

(2) **ARFF Vehicles.** Emergency rescue and fire fighting vehicles are marked with the letters "ARFF," "Fire," or "Rescue" and in accordance with 4.c.(1)-(5) of this AC.

**b. Airport Operations Vehicles.** Airport operations vehicles may be marked as designated by the airport operator. Marking must be coordinated with the respective ATCT and identified in the tower letter of agreement.

**c. Airfield Service Vehicles and Aircraft Support Vehicles.**

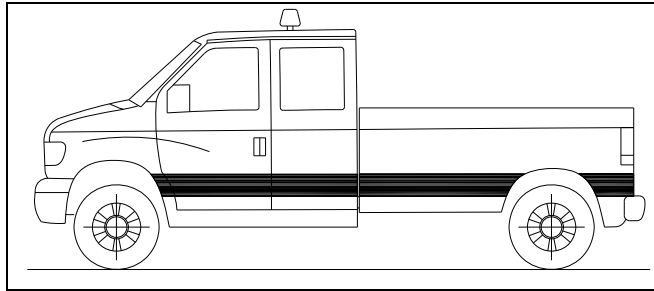
(1) Airport operator owned vehicles must display an identification number on each side and on the roof (the hood should be used if the vehicle has no roof).

(2) Side numbers will be a minimum of 16 inches (410 mm) in height and conspicuously located.

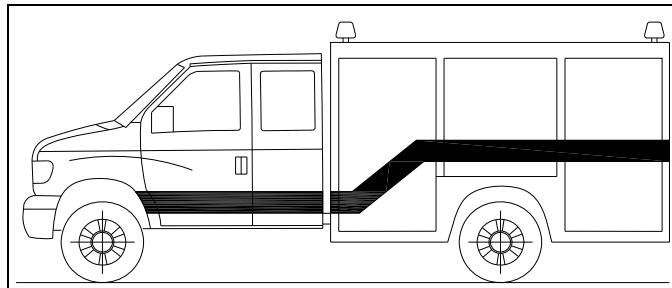
(3) Roof numbers will be a minimum of 24 inches (610 mm) in height and affixed with their bases toward the front of the vehicle. The identification numbers should provide sharp color contrast to the vehicle color.

(4) In addition to the identification numbers, airport operator-owned vehicles must display either the name of the airport and/or the airport insignia.

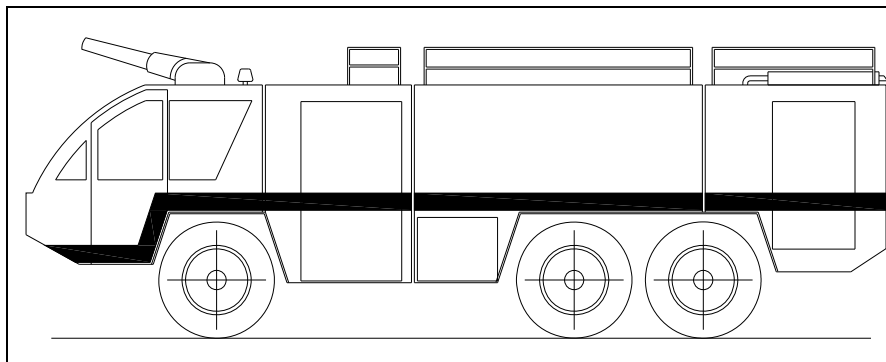
(5) To further improve night-time recognition of vehicles, a minimum 8 inch (200 mm) wide horizontal band of high gloss white paint or white reflective tape (Retroreflective, ASTM-D 4956-09, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Type III & above) must be used around the vehicle's surface. Figures 1, 2, and 3 show suggested locations for the horizontal reflective band.



**Figure 1: Suggested location for the horizontal reflective band, Option 1**

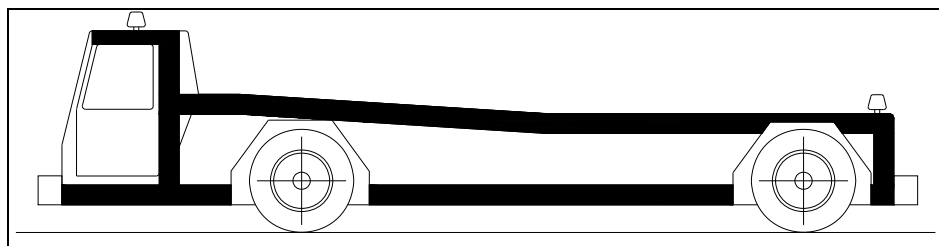


**Figure 2: Suggested location for the horizontal reflective band, Option 2**



**Figure 3: Suggested location for the horizontal reflective band, Option 3**

**(6) TLTVs.** Retroreflective tape is used to outline the shape of a TLTV. If the vertical edge of the vehicle is rounded, the tape should be placed on the rounded portion to reflect light in both the horizontal and vertical planes. Where the placement of the tape may interfere with, or may be worn down by, maintenance or operational activities, tape is not required. Suggested locations for the retroreflective bands are shown in Figure 4.



**Figure 4: Suggested placement of retroreflective tape on a TLTV**

**d. Airport Security and Other Vehicles.**

- (1) Vehicles other than those that routinely traverse any portion of the AOA under the control of ATC, which are not escorted by a vehicle in constant two-way radio communication with ATC and properly equipped and authorized to operate in the AOA, must be provided with a flag on a staff attached to the vehicle so that the flag will be readily visible.
- (2) At airports without air traffic control facilities, flags must be provided on all vehicles.
- (3) The flag must be at least a 3-foot by 3-foot (0.9 meter by 0.9 meter) square having a checkered pattern of international orange and white squares at least 1 foot (300 mm) on each side (see Appendix A for the fabric color specification).

**5. VEHICLE LIGHTING.**

**a. Airfield Service, Aircraft Support, and Airport Operations Vehicles.**

- (1) The standard for identification lighting is a yellow flashing light that is mounted on the uppermost part of the vehicle structure. A steady yellow light designates vehicles limited to non-movement areas.
- (2) The light must be visible from any direction, day and night, including from the air.
- (3) Color specifications for vehicle identification lights are per Appendix B.
- (4) **TLTVs.** An LED light bar placed above the operator's cab may be used in place of the rotating yellow flashing light. In addition, a yellow flashing light (of any type) must be installed on the upper left-rear and right-rear corners of the TLTV, and must be activated when an aircraft is in tow. The size of the rear flashing lights must be large enough to meet the requirements of Section 5.c, but not so large as to interfere with the normal or towing operations of the TLTV.

**b. Airport Emergency, Security, and Other Vehicles,** which are not escorted by a properly lighted vehicle, must be identified during periods of low visibility by a light.

**c. Characteristics of Flashing Lights:**

- (1) Ambulance lights must meet the specifications in the most current version of Federal Specification KKK-A-1822, and ARFF vehicles must meet NFPA, state, and local requirements.
- (2) Lights must have peak intensity within the range of 40 to 400 candelas (effective) from 0° (horizontal) up to 10° above the horizontal and for 360° horizontally. The upper limit of 400 candelas (effective) is necessary to avoid damage to night vision.
- (3) From 10° to 15° above the horizontal plane, the light output must be 1/10<sup>th</sup> of peak intensity or between 4 and 40 candelas (effective).

- (4) Lights must flash at  $75 \pm 15$  flashes per minute.

**NOTES:**

- 1. The effective intensity of a flashing light is equal to the intensity of a steady-burning (fixed) light of the same color that produces the same visual range under identical conditions of observation.*
- 2. If xenon flashtubes are used, refer to AC 150/5345-43, Specification for Obstruction Lighting Equipment, for guidance concerning methods of calculating effective intensity.*

**d. Light Colors.**

**(1) Airport Emergency Vehicles.**

(a) **Ambulances.** Per the most current version of Federal Specification KKK-A-1822.

(b) **ARFF Vehicles.** Red or a combination of red-and-white flashing lights per the chromaticity requirements in Appendix B.

**(2) Airport Security Vehicles.** Signal blue or a combination of red and signal blue flashing light per the chromaticity requirements in Appendix B.

**(3) Airfield Service, Aircraft Support, Airport Operations, and Other Vehicles.** Yellow flashing light per the chromaticity requirements in Appendix B.

**APPENDIX A. COLOR SPECIFICATIONS**

**A-1. SPECIFICATIONS.** Colors specified in Table A-1 are per the Commission Internationale de l'Eclairage (CIE) L\*a\*b\* system of color specification. For a description of this system, refer to American Society for Testing & Materials (ASTM) D 2244, *Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates*.

**Table A-1. Specification for vehicle and flag colors**

Standard Illuminant D65 Usage	Chrome Yellow			Yellowish-Green			International Orange		
	Vehicle Paint			Vehicle Paint			Vehicle Paint / Flag Fabric		
CIELAB DATA	L*	a*	b*	L*	a*	b*	L*	a*	b*
Centroid Color	72.8	24.4	77.6	78.3	-10.2	80.4	45.0	53.5	52.0
Point 1	72.8	31.8	82.9	78.3	-9.0	92.0	45.0	61.4	47.8
Point 2	72.8	25.5	66.7	78.3	-7.6	73.2	45.0	53.9	41.4
Point 3	72.8	18.0	69.3	78.3	-11.0	69.3	45.0	53.5	53.4
Point 4	72.8	22.4	86.0	78.3	-13.4	86.2	45.0	49.7	60.4
Light Limit	77.8			83.3			49.9		
Dark Limit	67.8			73.3			41.6		
Max ΔE	11.1			11.7			10.7		

**A-2. COLOR TESTS.** Acceptable colors are those that meet the gloss rating test and either a visual or an instrumental color test as follows:

**NOTE:** Flag fabric colors must meet either the instrumental tests in Table A-1 or the visual method described in paragraph A-2b(1).

**a. Gloss Rating Test.** This test is performed per ASTM D 523, *Standard Test Method for Specular Gloss*, on a paint sample of the color to be applied on the vehicle. An acceptable color sample is high gloss with a minimum gloss rating of 70 units, for 60° geometry.

**b. Color Test Methods:**

**(1) Visual.** Prepare a master specimen of the color (per Table A-1) and gloss (per paragraph A-2a). This specimen will be the master color and be used as the basis of comparison per ASTM D 5531-05, *Standard Guide for the Preparation, Maintenance, and Distribution of Physical Product Standards for Color and Geometric Appearance of Coatings*. To verify the paint color of a vehicle visually, vehicle paint samples must be

prepared and viewed per ASTM D 1729-96 (Reapproved 2009), *Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials*.

**(2) Instrumental.** This test requires a test specimen sample and reference to Table A-1. All test specimen measurements should be conducted per ASTM E 1164-09a *Standard Practice for Obtaining Spectrometric Data for Object-Color Evaluation*. Test specimen tolerances must be per Table A-1 per the following:

(a) Plot the centroid color using the  $a^*$  and  $b^*$  CIELAB coordinate data from Table A-1 on graph paper or by entry of the coordinate data into a computer program. Plot and connect points 1 through 4 from the same table to form a quadrilateral; noting that the centroid color is within this figure. See Figure A-1 for plots of all three color specifications in Table A-1.

(b) Perform color sample measurements per ASTM E 1164-09a. If necessary, convert measurements to CIELAB  $L^*$ ,  $a^*$ , and  $b^*$  color space. See ASTM E 308-08, *Standard Practice for Computing the Colors of Objects by Using the CIE System*, for color space conversion formulae.

(c) An acceptable color is one that meets:

(i) the chromaticity requirements of the color samples  $a^*$  and  $b^*$  CIELAB coordinate data by falling within the quadrilateral;

(ii) the  $L^*$  data lightness requirement by falling within the range defined by the light and dark data of Table A-1;

(iii) the total color difference ( $\Delta E$ ) by not exceeding the limits in Table A-1 when the CIELAB data are computed in the following formula:

$$\Delta E = (\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2})^{\frac{1}{2}}$$

where  $\Delta L^*$ ,  $\Delta a^*$ , and  $\Delta b^*$  values are the differences between those values for the centroid color in Table A-1 and those of the color sample measurements.

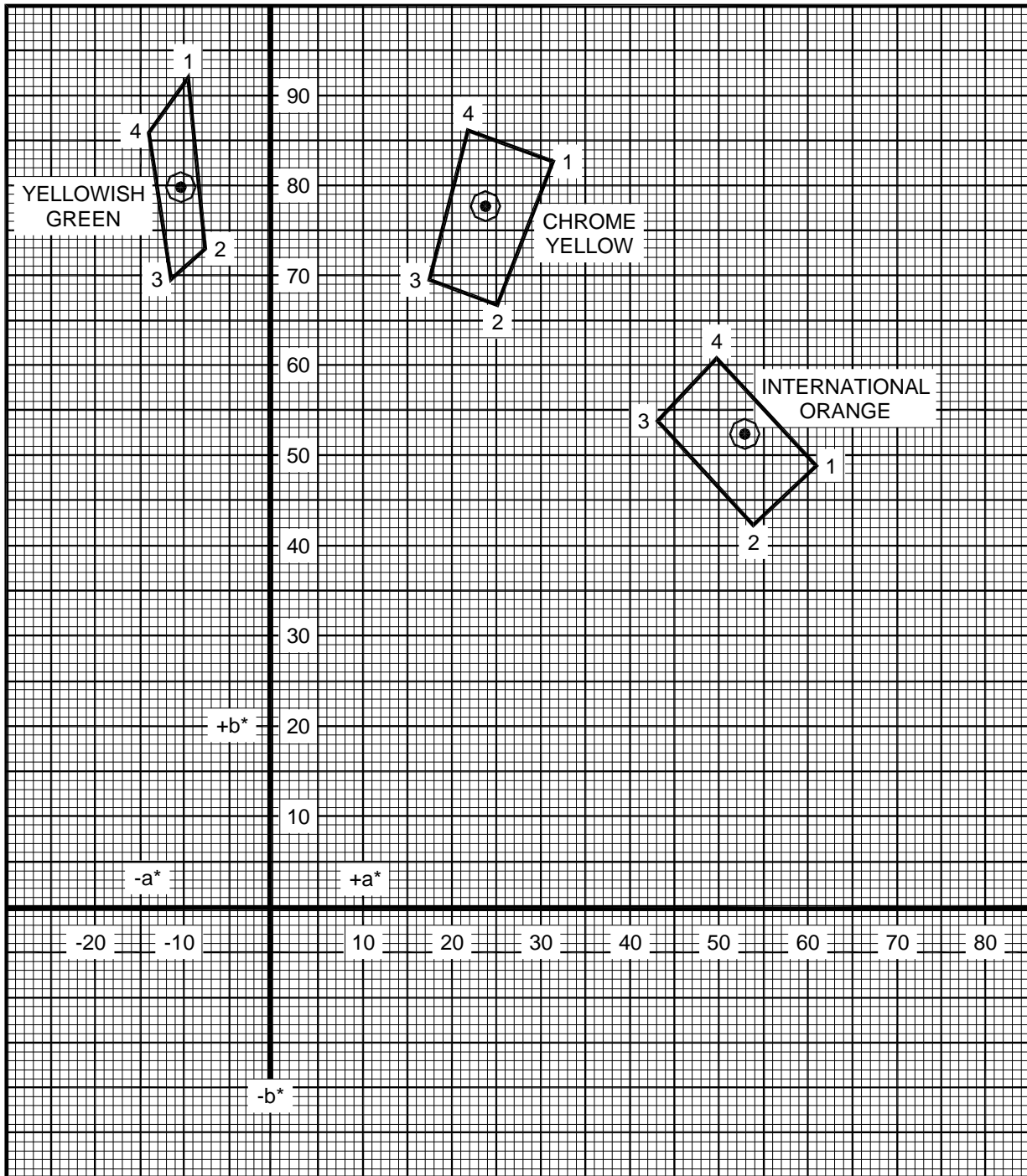


Figure A-1. Plot of selected color paint specifications

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**APPENDIX B. COLOR SPECIFICATIONS FOR VEHICLE IDENTIFICATION LIGHTS**

**B-1. SPECIFICATIONS.** The Society of Automotive Engineers (SAE) Standard J578 Revised December 2006, *Color Specification*, defines the acceptable color boundary limits and measurement of emitted red, white, signal blue, and yellow light for vehicle lights. This standard applies to the overall emitted color of light from the device in lieu of emitted light from any small area of the lens. The color of emitted light must fall within the color boundaries per SAE J578 Revised December 2006 (color boundary equations are in the standard) using color measurement methods detailed in the standard. See FAA Engineering Brief #67, Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures, for additional information and Alternative Lighting Devices.

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U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

# Advisory Circular

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**Subject:** GROUND VEHICLE OPERATIONS ON AIRPORTS

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**Date:** March 31, 2008

**AC No:** 150/5210-20

**Initiated by:** AAS-300

**Change:** 1

**1. PURPOSE.** This Advisory Circular (AC) and the attached appendices provide guidance to airport operators in developing training programs for safe ground vehicle operations and pedestrian control on the airside of an airport. This includes both movement and non-movement areas, ramps, and aprons. Not all the items addressed in this document will be applicable at every airport. The Federal Aviation Administration (FAA) recommends that each item be evaluated in terms of how it may apply to the size, complexity, and scope of operation of the airport. This AC contains recommended operating procedures, a sample training curriculum (Appendix A), and a sample training manual (Appendix B).

**2. BACKGROUND.** Every year there are accidents and incidents involving aircraft, pedestrians, and ground vehicles at airports that lead to property damage and injury, which may be fatal. Many of these events result from inadequate security measures, a failure to maintain visual aids, a lack of such aids, and inadequate vehicle operator training. Ground vehicle operation plans promote the safety of airport users by helping identify authorized areas of vehicle operation, outlining vehicle identification systems, addressing vehicle and operator requirements, and coordinating construction, maintenance, and emergency activities.

**3. APPLICABILITY.** The overall responsibility for the operation of vehicles on an airport rests with the airport operator. The airport operator is also responsible for compliance with the requirements of part 139 at certificated airports and with the provisions of any applicable Federal grant agreements. Adherence to the provisions contained in this AC may materially assist the airport operator in complying with these requirements.

**a.** All airport operators should establish procedures and policies concerning vehicle access and vehicle operations on the airside of the airport, including ramp and apron areas. These procedures and policies should address such matters as access, vehicle operator requirements, vehicle requirements, operations, and enforcement and should be incorporated into tenant leases and agreements.

**b.** Establishment of procedures for the safe and orderly access to the movement area and operation in that area is required at certificated airports, under 14 C.F.R. § 139.329(b). Initial and recurrent training in procedures for access to the movement area is required for airport personnel under § 139.303(c). Only initial training is required for tenant and contractor employees, under § 139.329(e). However, regular recurrent training is strongly recommended for all persons with access to the movement area.

**c.** Each bidding document (construction plans and/or specifications) for development work on an airport or for installation of an air navigation facility (NAVAID) should incorporate a section on ground vehicle operations on airports during construction activity. The airport operator should provide a copy of this plan to the local FAA Airways Facilities office for review. The construction plans and/or specifications should contain the appropriate provisions, as specified in Appendix 1 of AC 150/5370-2, *Operational Safety on Airports During Construction*.

**4. RELATED READING MATERIAL.** You will find additional information in the following publications:

- a. 14 CFR part 139, Certification of Airports
- b. Current editions of the following advisory circulars:
  - (1) AC 90-67, Light Signals from the Control Tower for Ground Vehicles, Equipment, and Personnel
  - (2) AC 120-57, Surface Movement Guidance and Control System
  - (3) AC 150/5210-5, Painting, Marking, and Lighting of Vehicles Used on an Airport
  - (4) AC 150/5340-1, Standards for Airport Markings
  - (5) AC 150/5340-18, Standards for Airport Sign Systems
  - (6) AC 150/5370-2, Operational Safety on Airports During Construction
  - (7) AC 150/5210-18, Systems for Interactive Training of Airport Personnel
  - (8) AC 150/5200-30, Airport Winter Safety and Operations
- c. To view or download an electronic copy of this AC, visit the FAA website at <http://www.faa.gov>.

**5. VEHICLE OPERATOR REQUIREMENTS.** Vehicle operators on airports face conditions that are not normally encountered during highway driving. Therefore, those persons who have vehicular access to the movement area of the airport must have an appropriate level of knowledge of airport rules and regulations. Airport operators should require vehicle operators to maintain a current driver's license and should establish a means of identification that would permit the operation of a vehicle on the airside of an airport. Any person expected to operate on the movement area should demonstrate a functional knowledge of the English language.

**6. TRAINING.** Appendix A includes a sample training curriculum. This curriculum should include initial and/or remedial instruction of all personnel who have access to the airside of the airport. The curriculum should also include annual recurrent instruction for all personnel who have access to the movement area. The airport operator should retain records of this training as long as this person is authorized to operate on the airport. Escorted access

does not normally require training. Airport operators may modify these documents to meet their individual needs. It may also be advantageous to develop customized programs for vehicles operators who only access ramp areas and those who operate on the movement area.

Initial training is the training provided to a new employee or airport user that would enable that person to demonstrate the ability to operate a vehicle safely and in accordance with established procedures while functioning independently on the airside. Recurrent training is the training provided to an employee or airport user as often as necessary to enable that person to maintain a satisfactory level of proficiency. Appropriate schedules for recurrent training will vary widely from airport to airport and from one employee to another, however, under no circumstances should recurrent training intervals for personnel authorized to drive on the movement area extend beyond one year. Airport operators might consider requiring annual recurrent training when a vehicle operator renews an expired airport ID badge or when a tenant renews a lease agreement. A sample Ground Vehicle Operating Familiarization Program Training Record is included in Appendix B.

Airports use a variety of methods for training ground vehicle operators. In some cases, airport operators delegate the requirement of employee training to airport tenants or a contractor. Some airport operators choose to include training manuals or vehicle-operating requirements as part of tenant lease or use agreements. An airport operator may choose to distribute training manual information via a Web page, videos, or booklets. Formal classroom instruction provided by the airport operator or tenant can include either personal instruction or a computer-based interactive training system. (See AC 150/5210-18.)

Airport operators should provide a means of testing trainees on the information presented. In addition to standard question and answer classroom testing methods, the airport operators should have potential ground vehicle operators demonstrate their proficiency in operating a vehicle on the airside before authorizing driving privileges. The FAA also recommends on-the-job training before personnel have unescorted access to the airside of the airport.

**7. VEHICLES ON AIRPORTS.** Airport operators should keep vehicular and pedestrian activity on the airside of the airport to a minimum. Vehicles on the airside of the airport should be limited to those vehicles necessary to support the operation of aircraft services, cargo and passenger services, emergency

services, and maintenance of the airport. Vehicles on the movement area should be limited to those necessary for the inspection and maintenance of the movement areas and emergency vehicles responding to an aircraft emergency on the movement area. Vehicles should use service roads or public roads in lieu of crossing movement areas whenever possible. Where vehicular traffic on airport operation areas cannot be avoided, it should be carefully controlled.

When necessary, runway crossing should occur at the departure runway end rather than the midpoint. In the event of a runway incursion, an aircraft would have more time and runway length to react if the vehicle incursion is at the end of the runway.

Some aspects of vehicle control and identification are discussed below; however, every airport presents different vehicle requirements and problems. Every airport will require individualized solutions to prevent vehicle or pedestrian traffic from endangering aircraft operations. It should be stressed that aircraft ALWAYS have the right-of-way over vehicles when maneuvering on non-movement areas. Aircraft also have the right-of-way on the movement areas, except when the Airport Traffic Control Tower (ATCT) has specifically instructed an aircraft to hold or give way to vehicle(s) on a runway or taxiway.

Vehicles that routinely operate on the airside should be marked/flagged for high daytime visibility and, if appropriate, lighted for nighttime operations. Vehicles that are equipped with marking and lighting devices should escort vehicles that are not marked and lighted. (See AC 150/5210-5.) Vehicles needing intermittent identification should be marked with magnetically attached markers, which are commercially available.

**8. VEHICULAR ACCESS CONTROL.** The control of vehicular activity on the airside of an airport is of the highest importance. The airport operator is responsible for developing procedures, procuring equipment, and providing training regarding vehicle operations to ensure aircraft and personnel safety. At airports with an operating ATCT, controllers and vehicle operators should use two-way radios to control vehicles when on the movement area. To accomplish this task, the airport operator and the ATCT should develop a letter of agreement outlining standard operating procedures. When there is construction on an airport, whether federally funded or not, the airport operator should follow the ground vehicle practices contained in AC 150/5370-2.

At airports without an operating ATCT, two-way radio control between vehicles and fixed-based operators or other airport users should avoid frequencies used by aircraft. Even with the most sophisticated procedures and equipment, vehicle operators need training to achieve the proficiency to operate safely. The airport operator should give special consideration to training temporary operators, such as construction workers, even if escort service is being provided.

Inadvertent entry by vehicles onto movement and non-movement areas of an airport poses a danger to both the vehicle operator and aircraft that are attempting to land or take off or that are maneuvering on the airport. Methods for controlling access to the airside will vary depending on the type and location of the airport. The Airport Layout Plan is a useful tool for accomplishing this. Airports may erect a fence or provide for other natural or physical barriers around the entire airport in addition to providing control measures at each access gate, such as guards, magnetic card activated locks, or remotely controlled locks. Gates may either be opened/closed electronically or secured by lock and chain. Physical barriers might include natural objects, such as earthen berms, large boulders, tree trunks, and manmade culverts that could help control remote vehicle access points.

**9. VEHICLE REQUIREMENTS.** Requirements for vehicles will vary depending on the airport, the type of vehicle, and where the vehicle will be operated on the airport. An airport operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport. Airport operators might find it beneficial to have separate requirements for vehicles operated solely on a ramp area as opposed to those vehicles that operate on movement areas.

Some airports have benefited from establishing their own vehicle inspection program to assure that all vehicles are maintained in a safe operating condition. In establishing vehicle requirements, some items to consider include—

- a. Marking and identification of vehicles
- b. Minimum equipment requirements
- c. Inclusion in all vehicles of a placard

diagram depicting the airport's movement area. The diagram should display prominent landmarks and/or perimeter roads. Vehicles intended to operate within the movement area should also include a placard

showing the meaning of ATCT light gun signals and airfield sign and marking information.

d. Vehicle condition requirements and inspection

e. Insurance coverage

**10. VEHICLE OPERATIONS.** The rules and regulations pertaining to vehicle operations should provide adequate procedures for the safe and orderly operation of vehicles on the airside of the airport. In developing such procedures, airport operators should consider—

a. Requirements that vehicles operating on movement areas be radio equipped or escorted by a radio-equipped vehicle

b. Specific procedural requirements for vehicle operations on airports without an operating ATCT

c. Advance notice/approval for operating a non-airport owned vehicle on the movement area

d. Speed limits

e. Prohibitions on—

(1) Passing other vehicles and taxiing aircraft

(2) Leaving a vehicle unattended and running

(3) Driving under an aircraft except when servicing the aircraft

(4) Driving under passenger bridges

f. Requirements stipulating when vehicle lights must be operated

g. Requirements for the use of dedicated vehicle lanes and perimeter roads whenever possible

h. Locations where vehicles may and may not park

i. Rules of right-of-way (e.g. for aircraft, emergency vehicles, other vehicles)

j. Areas where vehicles may be serviced

k. Procedures for inoperative radios while on a movement area

l. Requirements to report all accidents involving ground vehicles on the airside

m. Requirements making the vehicle operator responsible for passengers in the vehicle

**11. EMERGENCY OPERATIONS AND OTHER NON-ROUTINE OPERATIONS.** Airport operators allow a number of non-routine operations to occur on the airside of the airport. Such non-routine activities include airfield construction, airshows, aircraft static displays, VIP arrivals/departures, commercial photo shoots, or a host of other activities. In addition to security requirements, airport operators should recognize and prepare for the unique challenges that arise during non-routine operations as they relate to vehicle operations.

Airport operators should review non-routine operations that involve ground vehicles and develop vehicle operation procedures to accommodate these special operations. Planning meetings associated with such activities offer an opportunity to review driving rules and regulations, communications and procedures, and air traffic control procedures as well as other important operational issues.

These meetings should pay special attention to the following activities:

a. **Airside Construction.** The airport operator should develop procedures, procure equipment, and provide training on vehicle operations to ensure aircraft safety during construction as specified in AC 150/5340-2.

b. **Emergency Response/Mutual Aid.** Many airports rely on local emergency services to provide aircraft rescue and firefighting or emergency medical services. Airport operators should ensure that such emergency service providers receive initial and recurrent training in the subject areas identified in paragraph 10, Vehicle Operations, and maintain records of such training. In addition, any mutual aid agreement between the local emergency service providers and the airport operator should specify vehicle operations training requirements.

c. **Snow and Ice Removal.** Airport Operators who use contractors for snow and ice control operations should ensure agreements with such contractors include vehicle operations procedures, including training requirements, consequences of non-compliance, and vehicle communications requirements. The FAA recommends that, when possible, airport operators limit contractors to non-movement areas. When an ATCT is not in operation, or there is no ATCT, procedures should be developed to advise air traffic on the Common Traffic Advisory Frequency (CTAF) of any intentions to remove snow and ice in the movement area.

d. **Low-Visibility Operations.** Additional consideration should be given to vehicle operations

during low visibility. Poor weather conditions (snow, fog, rain, etc.) may obscure visual cues, roadway markings, and airport signs.

Some airports have a Surface Movement Guidance and Control System (SMGCS), which provides guidance to, and control or regulation of, all aircraft and ground vehicles on the movement area of an airport. Guidance relates to facilities, information, and advice necessary to enable pilots of aircraft, or drivers of ground vehicles, to find their way on the airport and keep the aircraft or vehicles on the surfaces and areas intended for their use. Control or regulation means the measures necessary to prevent collisions and to ensure that the traffic flows safely. For additional information on the SMGCS and the SMGCS Plan, refer to AC 120-57.

**12. SITUATIONAL AWARENESS.** There are a number of factors that hamper vehicle operator situational awareness. Situational awareness declines as a driver's attention is drawn into the vehicle or is focused on any one thing to the exclusion of everything else. Other such factors include vague or incomplete communications or a vehicle operator's personal conflicts, which may involve fatigue and stress. Running behind schedule or being over-tasked also contributes to a reduction in situational awareness. Certainly, degraded operating conditions, such as equipment malfunctions, rain, fog, or snow, may also diminish a vehicle operator's situational awareness.

There are ways to enhance situational awareness. As part of a ground vehicle operator's training program, airport operators may concentrate on having vehicle operators visually scan fixed and moving objects that may be converging into the vehicle's path. Airport operators should also promote the use of clear and concise communications by vehicle operators. Most important, airport operators should alert vehicle operators to distractions caused by social interactions while operating a vehicle on the airside.



Kelvin L. Solco  
Acting Director of Airport Safety and Standards

Airport operators may also be able to increase situational awareness for vehicle operators with enhancements on the airside. Such enhancements may include establishing dedicated marked routes for vehicles that avoid high activity, congested areas, or blind spots. The elimination or relocation of fixed objects that hinder a vehicle operator's line of sight or block radio transmissions may also enhance safety.

**13. ENFORCEMENT AND CONTROL.** Airport operators should establish procedures for enforcing the consequences of non-compliance, including penalties for violations. Tenant lease or use agreements may include these enforcement provisions. Listed below are control issues that airport operators should address as part of a ground vehicle control program:

- a. Implementation of a tiered identification badging system that permits easy recognition of a vehicle operator's permitted driving area privileges
- b. Prohibition against transfer of registration media to a vehicle other than the one for which originally issued
- c. Policies for surrendering permits to airport management when a vehicle is no longer authorized entry into a facility
- d. Periodic checks to ensure that only properly authorized persons operate vehicles on the airside.
- e. System to control the movement of commercial trucks and other goods conveyances onto and out of the airside of an airport
- f. Briefing or training for delivery drivers if they are permitted direct access to the airside
- g. Implementation of a progressive penalty policy

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## APPENDIX A

### GROUND VEHICLE ACCESS PROGRAM TRAINING CURRICULUM

**NOTE:** The purpose of the Ground Vehicle Access Program Training Curriculum is to provide airport operators with a comprehensive list of training topics for educating vehicle operators who may have access to the airside of an airport. Each individual airport has unique situations that might require site-specific training. Airport operators may use this training curriculum as a guide for developing and implementing a detailed training program tailored to the airport's individual situation.

The purpose of a training program is to provide vehicle operators with the level of training necessary for their positions so they are capable of operating safely on the airside of an airport. Specific programs may be tailored to account for the items listed below:

1. Various infield aircraft navigation aids
2. Identification of a given point on a grid map or other standard map used at the airport
3. Applicable airport rules, regulations, or procedures pertaining to vehicle operations
4. Airport layout, including designation of runways and taxiways
5. Boundaries of movement areas

6. Interpretation and color coding of airfield signs, pavement markings, and lighting
7. Location and understanding of critical areas associated with instrument landing system (ILS) and very high frequency omnidirectional ranges (VORs)
8. Proper terminology (including phonetic alphabet) and procedures for radio communications with the airport traffic control tower (ATCT)
9. ATCT light gun signals
10. Established routes for emergency response vehicles
11. Dangers associated with jet blast and prop wash
12. Traffic patterns associated with each runway (left or right) and location of each leg; i.e., downwind, base, final, and crosswind
13. Situational awareness

An airport operator may choose to develop customized training programs for vehicle operators who are restricted to operating ground vehicles only on ramps and apron areas.

### AREAS OF TRAINING

**All drivers should have training in the following areas:**

1. Discussion of Runway Incursions, Airfield Safety, and Security  
Training Outcome(s) – Trainee should be able to define a runway incursion and explain the benefits of airfield safety/security.

2. Definitions and Terms  
Training Outcome(s) – Trainee should be knowledgeable of the terms used on an airport.

3. Vehicle Operating Requirements
  - a. Authorized Vehicles and Vehicle Identification
  - b. Vehicle Lighting
  - c. Vehicle Insurance
  - d. Vehicle Inspection

- e. Vehicle Parking
- f. Accident Reporting
- g. Perimeter Roadways
- h. Aircraft Lighting
4. Rules and Regulations
  - a. Review
  - b. Noncompliance/Penalties
 Training Outcome(s) – Trainee should be knowledgeable of ground vehicle rules and regulations.

5. Testing
  - a. Written Test
  - b. Practical Test
 Training Outcome(s) – Trainee should be able to pass a written examination with a minimum score of 90 percent.

**In addition to items 1–5, instruction for drivers authorized to drive on the movement area should also include those subject areas identified under Airport Familiarization and Communications.**

**6. Airport Familiarization**

- a.** Runway Configuration/Safety Area
- b.** Taxiway Configuration/Safety Area
- c.** Movement Areas and Non-Movement Areas
- d.** Confusing Areas
- e.** Airport Lighting

**(1) Runway**

- Runway Edge Lights
- Touchdown Zone
- Taxiway Lead-Off Lights
- Threshold
- Runway Approach Light System

**(2) Taxiway**

- Taxiway Edge Lights
- Taxiway Centerline Lights
- Runway Guard Lights

**f. Airfield Signage**

- Runway Position Holding Sign
- Taxiway Location Sign
- ILS Critical Area Sign
- Direction Sign
- Distance Remaining Sign

**g. Airfield Markings**

**(1) Runways**

- Centerline
- Edge Markings
- Runway ID Numbers
- Threshold Markings

- Hold Short Lines

**(2) Taxiways**

- Hold Lines
- ILS Hold Line
- Geographic Position Markings
- Centerline
- Edge Markings

**(3) ILS Critical Areas**

**(4) Non-Movement Area Boundary Marking**

**h. Airport NAVAIDS and Visual Approach Aids**

- Location
- Non-interference

Training Outcome(s) – Trainee should be able to label all critical parts on the airport and explain the purpose of all marking, lighting, and signs on the airport.

**7. Communications**

**a. Ground Vehicle Communications**

- (1) Radio Frequencies**
- (2) Procedural Words and Phrases**

**b. Aviation Phonetic Alphabet**

**c. Aviation Terminology**

**d. Procedures for Contacting the ATCT**

**e. Airfield Communications at Airports Without Operating ATCT**

**f. Light Gun Signals**

- Description of Light Gun and How to Signal Tower

**g. Lost Communications Procedures**

Training Outcome(s) – Trainee should be able to adequately send and receive radio messages.

## APPENDIX B

### SAMPLE GROUND VEHICLE OPERATIONS TRAINING MANUAL

**NOTE:** This sample training manual provides airport operators with a template for developing and implementing proposed policies or procedures for controlling ground vehicles and equipment accessing the airside of an airport. Airport operators may use the format below but adapt the requirements to specific conditions found on the airport. The first part of the appendix could serve as driving rules and regulations that could be adopted by the airport operator who would fill in the appropriate blanks or blocks of text or revise the document for a specific airport. Section 2 would serve as a suggested driver training manual. In this section, the airport operator could add or delete information as it applies to the airport. For example, if the airport has no instrument approach, reference to the ILS signs and protection of critical areas could be deleted. Also, the airport operator is encouraged to replace illustrations of signs with those found on the airport.

#### Section 1. Airport Driving Rules and Regulations

**1.1. Authority for Implementation of Rules and Regulations.** The (NAME) Airport operates under the authority of (JURDISTICTION). (CITY/COUNTY ORDINANCE OR STATE STATUTE) has granted the (AIRPORT OPERATOR) the authority to make bylaws for the management and supervision of its airport affairs.

**1.2. Applicability.** This regulation applies to all users of, and persons on any portion of, the property owned or controlled by (AIRPORT OPERATOR). No persons are exempt from airport operating training requirements for operating a vehicle on the airside of an airport. Tenant organizations shall be responsible for the dissemination of, accessibility to, and compliance with these rules and regulations by their employees.

These Rules and Regulations may be amended, changed, or modified by (AIRPORT OPERATOR), as necessary.

**1.3. Definitions.** The following terms are defined as indicated in this section for the purpose of this Ground Vehicle Operation Training Manual. *(The airport operator should include only those definitions applicable to its airport and conditions.)*

- 1.3.1 Accident**—a collision between one aircraft or vehicle and another aircraft, vehicle, person, or object that results in property damage, personal injury, or death.
- 1.3.2 Air Carrier Ramp**—a ramp for air carriers. Only authorized personnel and vehicles may operate on this ramp. Private vehicles and aircraft are prohibited from operating on it.
- 1.3.3 Airside**—those areas of an airport that support aircraft activities.
- 1.3.4 Airport Traffic Control Tower (ATCT)**—a service operated by an appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.
- 1.3.5 Aircraft**—a device that is used or intended to be used for flight in the air.
- 1.3.6 Airport**—(NAME) International Airport Facility, owned and operated by (AIRPORT OPERATOR), including all improvements and equipment existing or to be developed.
- 1.3.7 Apron or Ramp**—a defined area on an airport or heliport intended to accommodate aircraft for the purposes of parking, loading and unloading passengers or cargo, refueling, or maintenance.
- 1.3.8 Common Traffic Advisory Frequency (CTAF)**—radio frequency designed for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating ATCT or when the tower is closed. The CTAF may be a UNICOM, MULTICOM, FSS, or tower frequency and is identified in appropriate aeronautical publications. (See below for definitions of UNICOM, MULTICOM, and FSS.)
- 1.3.9 Fixed-Based Operator (FBO)**—a person, firm, or organization engaged in a business that provides a range of basic services to general aviation. Services may include the sale and dispensing of fuel, line services, aircraft parking and tie-down, pilot and passenger facilities, airframe and power plant maintenance, aircraft sales and rental, and pilot instruction.

- 1.3.10. Flight Service Station (FSS)**—air traffic facilities that provide pilot briefings, en route communications, and visual flight rules search and rescue services; assist lost aircraft and aircraft in emergency situations; relay air traffic control clearances; originate Notices to Airmen; broadcast aviation weather and National Airspace System information; receive and process instrument flight rules flight plans; and monitor NAVAIDS. In addition, at selected locations, FSSs provide En Route Flight Advisory Service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights.
- 1.3.11. Foreign Object Debris (FOD)**—debris that can cause damage to aircraft engines, tires, or skin from rocks, trash, or the actual debris found on runways, taxiways, and aprons.
- 1.3.12. General Aviation (GA)**—that portion of civil aviation that encompasses all facets of aviation except air carriers holding a certificate of public convenience and necessity.
- 1.3.13. Ground Vehicle**—all conveyances, except aircraft, used on the ground to transport persons, cargo, fuel, or equipment.
- 1.3.14. ILS Critical Area**—an area provided to protect the signals of the localizer and glideslope.
- 1.3.15. Incursion**—any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss separation with an aircraft taking off, intending to take off, landing, or intending to land.
- 1.3.16. Jet Blast**—jet engine exhaust or propeller wash (thrust stream turbulence).
- 1.3.17. Law Enforcement Officer (LEO)**—any person vested with police power of arrest under Federal, state, county, or city authority and identifiable by uniform, badge, and other indication of authority.
- 1.3.18. Light Gun**—a hand-held, directional light-signaling device that emits a bright narrow beam of white, green, or red light, as selected by the tower controller. The color and type of light transmitted can be used to approve or disapprove anticipated pilot or vehicle actions where radio communication is not available. The light gun is used for controlling traffic operating in the vicinity of the airport and on the airport movement area.
- 1.3.19. Mobile Fueller**—a vehicle owned and/or operated by authorized agents to pump and dispense Jet A and 100 LL fuel at (AIRPORT). This may include fuel tankers, in-to-plane fueling pumpers, and hydrant carts.
- 1.3.20. Movement Area**—the runways, taxiways, and other areas of an airport that aircraft use for taxiing, takeoff, and landing, exclusive of loading ramps and parking areas, and that are under the control of an air traffic control tower.
- 1.3.21. MULTICOM**—a mobile service not open to public correspondence used to provide communications essential to conduct the activities being performed or directed from private aircraft.
- 1.3.22. Non-movement Areas**—taxiways, aprons, and other areas not under the control of air traffic or at airports without an operating airport traffic control tower.
- 1.3.23. Operator**—any person who is in actual physical control of an aircraft or a motor vehicle.
- 1.3.24. Owner**—a person who holds the legal title of an aircraft or a motor vehicle.
- 1.3.25. Restricted Areas**—areas of the airport posted to prohibit or limit entry or access by the general public. All areas other than public areas.
- 1.3.26. Runway**—a defined rectangular area on a land airport prepared for the landing and takeoff run of aircraft along its length.
- 1.3.27. Runway in Use or Active Runway**—any runway or runways currently being used for takeoff or landing. When multiple runways are used, they are all considered active runways.
- 1.3.28. Runway Safety Area**—a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

- 1.3.29. Surface Movement Guidance and Control System (SMGCS)**—a system comprising the provisions for guidance to, and control or regulation of all aircraft, ground vehicles, and personnel of the airport during low-visibility operations. Guidance relates to facilities and information necessary for pilots and ground vehicle operators to find their way about the airport. Control or regulation means the measures necessary to prevent collisions and to ensure that traffic flows smoothly and efficiently.
- 1.3.30. Taxiways**—those parts of the airside designated for the surface maneuvering of aircraft to and from the runways and aircraft parking areas.
- 1.3.31. Tie Down Area**—an area used for securing aircraft to the ground.
- 1.3.32. Uncontrolled Airport**—an airport without an operating airport traffic control tower or when airport traffic control tower is not operating.
- 1.3.33. UNICOM**—a non-Federal communication facility that may provide airport information at certain airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.
- 1.3.34. Vehicle Service Road**—a designated roadway for vehicles in a non-movement area.
- 1.3.35. Very High Frequency Omnidirectional Range (VOR)**—a ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the National Airspace System.
- 1.3.36. Wake Turbulence**—phenomenon resulting from the passage of an aircraft through the atmosphere. The term includes vortices, thrust stream turbulence, jet blast, jet wash, propeller wash, and rotor wash both on the ground and in the air.
- 1.4. Severability.** If any section, subsection, subdivision, paragraph, sentence, clause, or phrase of these Rules and Regulations or any part thereof is for any reason held to be unconstitutional, invalid, or ineffective by any court of competent jurisdiction or other competent agency, such decision will not affect the validity or effectiveness of the remaining portions of these Rules and Regulations.
- 1.5. Violation of Rules—Penalties and Suspension of Driving Privileges.** Any person who does not comply with any of the provisions of these Rules and Regulations, or any lawful order issued pursuant thereto, will be subject to progressive penalties for repeat violations. These penalties may include denied use of the Airport by (OPERATOR) in addition to the penalties described pursuant to Federal, state, or local authorities. *(The airport operator should tailor this section to discuss its enforcement policies.)*
- 1.5.1.** Penalties for failure to comply with the Airside Vehicular Traffic Regulations shall consist of written warnings, suspension of airside driving privileges, and/or revocation of airside driving privileges. Receipt of \_\_\_\_\_ written warnings by an operator of a vehicle in any 12-month period will automatically result in suspension of airside driving privileges. Receipt of \_\_\_\_\_ written warnings in any 12-month period will automatically result in revocation of airside driving privileges.
- 1.5.2.** Based on an evaluation of the circumstances or the severity of a particular incident or incidents, the (AIRPORT OPERATOR) reserves the exclusive right to assess any penalty it deems appropriate at any time to any individual authorized to operate a vehicle on the airside without regard to prior operating history.
- 1.5.3.** Suspension of airside driving privileges shall be no less than \_\_\_\_\_ calendar days and no greater than \_\_\_\_\_ calendar days.
- 1.5.4.** The (AIRPORT OPERATOR) will provide a copy of all written warnings issued to an operator to the local manager of the company owning or in possession and control of the vehicle or vehicles involved in the violation(s).
- 1.6.** The (AIRPORT OPERATOR) shall require any individual involved in a runway incursion or other vehicle incident to complete remedial airfield driver training.

**1.7. Driver Regulations on the Airside of an Airport.****1.7.1. Vehicle Operator Requirements.**

1. All applicants must satisfactorily complete the applicable driver's training class before receiving an airside driver's license.
2. All applicants must pass the written test with a grade of at least \_\_\_\_ percent. Applicants who do not pass the written test may retake the test after additional study and a \_\_\_\_ day period.
3. Applicants for movement area driving privileges shall be required to successfully complete an airside driving test by a designated representative of (AIRPORT OPERATOR).
4. No vehicle shall be operated on the airside unless—
  - a. The driver is authorized to operate the class of vehicle by an appropriate state-licensing agency or by the driver's employer through a company training/certification program.
  - b. The driver properly displays an approved, airport-issued ID card with the Authorized Driver designation (*if applicable*).
5. No person operating or driving a vehicle on any aircraft ramp shall exceed a speed greater than \_\_\_\_ miles per hour. Factors including, but not limited to, weather and visibility shall be taken into consideration when determining safe operating speed.
6. No vehicle shall pass another ground vehicle in a designated vehicle roadway.
7. No vehicle shall pass between an aircraft and passenger terminal or passenger lane when the aircraft is parked at a gate position except those vehicles servicing the aircraft. All other vehicles must drive to the rear of the aircraft and shall pass no closer than \_\_\_\_\_ feet (\_\_\_\_ m) from any wing or tail section.
8. Moving aircraft and passengers enplaning or deplaning aircraft shall have the right-of-way at all times over vehicular traffic. Vehicle drivers must yield the right-of-way.
9. No vehicle operator shall enter the airside unless authorized by (AIRPORT OPERATOR) or unless the vehicle is properly escorted.
10. No vehicle operator shall enter the movement area—
  - a. Without first obtaining permission of the (AIRPORT OPERATOR) and clearance from the ATCT to enter the movement area;
  - b. Unless equipped with an operable two-way radio in communication with the ATCT; or
  - c. Unless escorted by an (AIRPORT OPERATOR) vehicle and as long as the vehicle remains under the control of the escort vehicle.
11. No person shall operate any motor vehicle that is in such physical or mechanical condition as to endanger persons or property or that the (AIRPORT OPERATOR) considers an endangerment.
12. No person shall—
  - a. Operate any vehicle that is overloaded or carrying more passengers than for which the vehicle was designed.
  - b. Ride on the running board or stand up in the body of a moving vehicle.
  - c. Ride with arms or legs protruding from the body of a vehicle except when the vehicle was designed for such use.
13. A vehicle guide person is required whenever the vision of the vehicle operator is restricted.
14. No fuel truck shall be brought into, stored, or parked within 50 feet of a building. Fuel trucks must not be parked within 10 feet from other vehicles.

15. Container carriers and tugs shall tow no more carts, pods, or containers than are practical, under control, tracking properly, and safe.
16. When not serving aircraft or undertaking their intended functions, ramp vehicles and equipment shall be parked only in approved areas.
17. Vehicle operators shall not operate or park vehicles under any passenger loading bridge.
18. No person shall park a vehicle in an aircraft parking area, safety area, or gross area or in a manner that obstructs or interferes with operations in the aircraft movement area or apron area.
19. No person shall park, or leave unattended, vehicles or other equipment that interfere with the use of a facility by others or prevent movement or passage of aircraft, emergency vehicles, or other motor vehicles or equipment.
20. No person shall park a vehicle or equipment within \_\_\_\_ feet (\_\_\_\_ m) of a fire hydrant or in a manner that prohibits a vehicle from accessing the fire hydrant.
21. No person shall operate a vehicle or other equipment within the airside under the influence of alcohol or any drug that impairs, or may impair, the operator's abilities.
22. Each vehicle operator using an airport perimeter (security) gate shall ensure the gate closes behind the vehicle prior to leaving the vicinity of the gate. The vehicle operator shall also ensure no unauthorized vehicles or persons gain access to the airside while the gate is open.
23. Vehicle operators shall not operate vehicles in a reckless or careless manner. A reckless or careless manner is one that intentionally or through negligence threatens the life or safety of any person or threatens damage or destruction to property.
24. Vehicles shall not enter the movement area or cross runways unless the operator of the vehicle has received required training and authorization from the (AIRPORT OPERATOR) to operate on the movement area. Whenever possible, all airport vehicles shall utilize the airport perimeter and service roads to transition between areas on the airport.
25. Each vehicle operator is responsible for the activities of each vehicle passenger on the airside of the airport.

**1.7.2. Vehicle Regulations.**

1. No vehicle shall be operated on the airside unless it has proper registration in the (STATE) or is a qualified off-road vehicle that is not normally operated on public streets but has received the approval of the (AIRPORT OPERATOR).
2. All vehicles operated on the airside must have vehicle liability insurance, as required by the (AIRPORT OPERATOR).
3. The (AIRPORT OPERATOR) must approve tenant vehicles operated on the movement and non-movement areas. These vehicles must display a (AIRPORT OPERATOR) sticker or an airport-approved company logo that is at least \_\_\_\_ inches (\_\_\_\_ cm) in height on the passenger and operator's doors.
4. Carts or pieces of equipment being towed or carried after darkness must have side and rear reflectors or rear lights.
5. No vehicle shall be permitted on the airside unless—
  - a. It is properly marked, as outlined in FAA Advisory Circular 150/5210-5, *Painting, Marking, and Lighting of Vehicles Used on an Airport*.
  - b. It is in sound mechanical condition with unobstructed forward and side vision from the driver's seat.

- c. It has the appropriately rated and inspected fire extinguishers (service vehicles and fuel trucks).
    - d. It has operable headlamps and brake lights.
  - 6. Vehicles operating on the movement area shall be equipped with operating amber rotating beacon or equivalent.
  - 7. All aircraft refueling vehicles and any other vehicle 8-foot or more in width shall be equipped with a flashing amber beacon and flashing front, tail, and clearance lights that are activated at all times when operating on the airside.
- 1.7.3. Vehicular Accidents.** Operators of vehicles involved in an accident on the airport that results in injury to a person or damage to an aircraft, airport property, or another vehicle shall—
- 1. Immediately stop and remain at the scene of the accident.
  - 2. Render reasonable assistance, if capable, to any person injured in the accident.
  - 3. Report the accident immediately to the (AIRPORT OPERATOR) before leaving the scene, if possible.
  - 4. Provide and surrender the following to any responding (AIRPORT OPERATOR) personnel: name and address, airport identification card, state driver's license, and any information such personnel need to complete a motor vehicle accident report.

## **Section 2. Driving on the Non-Movement Areas**

- 2.1.** Non-movement areas include taxiways, aprons, and other areas **not** under control of the ATCT. Anyone authorized to operate a motorized vehicle on the airside may do so on the non-movement areas without being in positive radio contact with the ATCT. These areas include—
- 2.1.1.** Service roads
  - 2.1.2.** Cargo aprons
  - 2.1.3.** General aviation apron
  - 2.1.4.** Air carrier apron(s)
- 2.2. Driving.** Operating within the ramp areas requires the vehicle driver to exercise extreme caution as aircraft are always moving, aircraft passengers may be walking from an aircraft to the gate, and noise levels are high. Vehicle drivers should—
- 2.2.1.** Never drive between safety cones or across delineated passenger walkways.
  - 2.2.2.** Watch cockpit blind spots—pilots typically cannot see behind or below the aircraft.
  - 2.2.3.** Avoid jet blast or prop wash, which can blow debris or overturn vehicles.
  - 2.2.4.** Be aware and avoid moving propellers that can cause damage, injury, or death.
  - 2.2.5.** Be aware of other vehicle movements—you may not hear them approaching due to aircraft engine noise.
  - 2.2.6.** Yield to aircraft, passengers, and emergency vehicles, which ALWAYS have the right-of-way on any portion of the airport.

When traveling on the apron, always use designated vehicle service roads. Driving close to buildings, around vehicles, or aircraft is prohibited. This policy helps to establish a predictable order to vehicle movements in congested areas and helps to ensure their visibility to aircraft and other vehicles.

Parked aircraft may still have their engines running, so be aware of the hazards of jet blast or prop wash, which may overturn vehicles. Before an aircraft engine is started, the aircraft's red flashing beacons must be on. In some instances, propellers and engine spinners are marked to indicate when the engine is operating. A pilot's ability to maneuver quickly on the ground is limited. Propellers and jet engines can cause significant damage and injury to personnel. In addition, cockpit visibility prohibits the pilot from seeing under the nose or behind the aircraft and limits the pilot's ability to avoid ground vehicles.

**2.3. Nighttime and Poor Weather Driving Conditions.** Poor weather conditions (snow, fog, rain, etc.) might obscure visual cues, roadway markings, and airport signs. Vehicle operators should remain vigilant of their surroundings and operating boundaries. Watch out for snow removal equipment and aircraft operating in the vicinity under low-visibility conditions. There are additional risks present under these conditions.

### Section 3. Driving on the Movement Areas

Drivers who are authorized to drive on the movement area require more training and vigilance since there are dangers associated with this area that are not present on non-movement areas. In addition to the principals for driving on the non-movement area, drivers who have access to the movement area must be cognizant of the meaning of airfield signs, markings, and lighting configurations. Additionally, they must be able to communicate with air traffic control (ATC) and be able to follow ATC directions.

**3.1. ATCT Control.** Movement areas are defined as the runways, taxiways, and other areas of the airport that are used for taxiing, hover taxiing, air taxiing, and takeoff and landing of aircraft, exclusive of loading ramps and aircraft parking areas. Movement areas are considered "positive control," meaning that all vehicle operators will need permission from ATC before entering the area.

**3.2. Authorized Vehicles.** Only those vehicles necessary for airport operations may enter a movement area. Therefore, fuel trucks, maintenance vehicles, tugs, catering trucks, and other nonessential vehicles should not be permitted to enter these areas. Exceptions may include (AIRPORT OPERATOR)-authorized vehicles with appropriately trained personnel. Airport Operations/Maintenance shall coordinate all other vehicle operations within the movement areas.

#### 3.3. Taxiways.

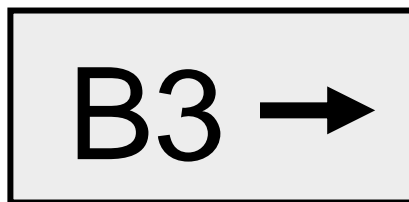
**3.3.1. Designations.** Aircraft use taxiways to move to and from the aprons and the runways.

Taxiways are designated by letters or by a letter/number combination such as A, B, G2, or B3. (The Airport Operator should include a diagram of the airport here with the taxiway and runway designations.)

**3.3.2. Lighting.** Taxiways are lighted with **blue** edge lighting and/or reflectors. Some taxiways are also lighted with **green** in-paved, centerline lighting. (*Use airport-specific example here.*)

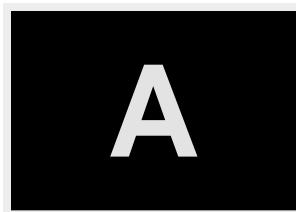
**3.3.3. Signs.** The signs used on taxiways are direction, destination, location, and taxiway ending marker signs.

**Direction and Designation Signs** have **black lettering** and a **directional arrow** or **arrows** on a **yellow background**. The arrow indicates the direction to that taxiway, runway, or destination.



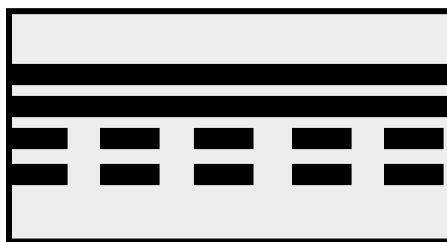
**Taxiway Directional Sign**

**Location Signs** have **yellow lettering** on a **black background**. The location sign below indicates that the operator of the vehicle/equipment is located on the named taxiway or runway.



**Taxiway Location Sign**

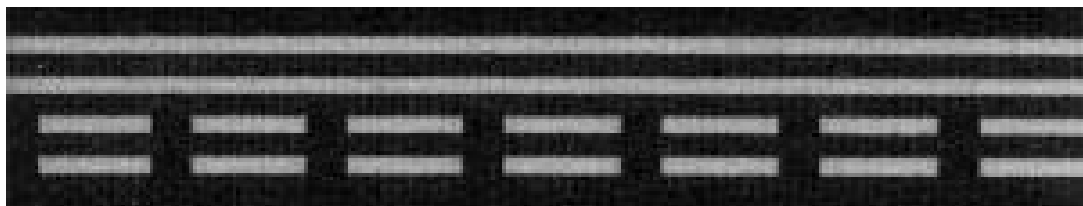
**Runway Safety Area/Object Free Zone (OFZ) and Runway Approach Area Boundary Signs**, when required, identify the boundary of the runway safety area/OFZ or the runway approach area to the pilot and vehicle operator. The driver can use these signs to identify when the vehicle is clear of the runway environment. It has a **black inscription** that depicts the holdline marking on a **yellow background**.



**Runway Safety Area/OFZ and Runway Approach Boundary Sign**

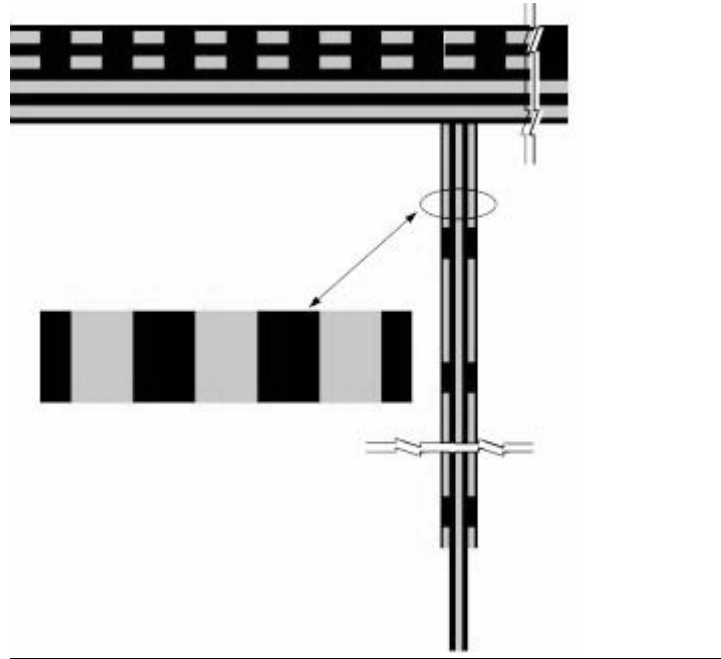
- 3.3.4. Markings.** Pavement markings on taxiways are always **yellow**. The taxiway centerline is painted on all taxiways. On the edges of some taxiways, there is a solid, double yellow line or double-dashed line. If pavements are usable on both sides of the line, the lines will be dashed; if not, the lines will be solid.

**Runway Holding Position Markings** are located across each taxiway that leads directly onto a runway. These markings are made up of **two solid lines** and **two broken yellow lines** and denote runway holding position markings. These markings are always co-located with a Runway Holding Position Sign. A vehicle operator must not cross from the solid-line side of the marking without first obtaining clearance.



**Runway Holding Position Marking**

**Enhanced Taxiway Centerline Markings** may be present at some airports, and will appear before a runway hold line, as illustrated below. These markings are intended to serve as an additional warning to flight crews that they are approaching the runway.



**Enhanced Taxiway Centerline Markings**

**Non-Movement Area Boundary Markings** consist of **two yellow lines** (one solid and one dashed). The solid line is located on the non-movement area side, while the dashed yellow line is located on the movement area side. A vehicle operator is not to cross from the solid-line side without first contacting the ATCT and obtaining a clearance to operate on the movement area.



**Non-Movement Area Boundary Marking**

**Instrument Landing System (ILS) Critical Area Holding Position Markings** are comprised of **two parallel yellow lines** with lines running perpendicular between the two parallel yellow lines. These markings identify the location on a taxiway where an aircraft or vehicle is to stop when it does not have clearance to enter ILS critical areas. The ILS critical area must remain clear, especially in inclement weather. If a vehicle proceeds past this ILS marking, it might cause a false signal to be transmitted to the landing aircraft.



**ILS Hold Position Marking**

### **3.4. Runways (*Use Airport Specific Examples*).**

**3.4.1. Designations.** Runways are areas where aircraft land and take off. Runways are always designated by a number such as 1 or 19. The number indicates the compass heading of the runway. An aircraft taking off on runway 19 is headed 190 degrees. In the event of parallel runways, a letter designation is added to indicate either the right or left runway; e.g., **1L-19R, 1R-19L**.

**3.4.2. Lighting.** Runways are lighted with a variety of colored lights.

**Runway Edge-lights** are **white**. **If the runway has an instrument approach**, the last 2,000 feet of the runway will be yellow in color.

**Runway Centerline Lights** are **white** except for the last 3,000 feet of the runway, where they begin to alternate **red** and **white**. For the last 1,000 feet of runway the centerline lights are all **red**.

**Runway Touchdown Zone Lights** are **white**.

**Runway End/Threshold Lights** are split lenses that are **red/green**.

**3.4.3. Signs.**

**Mandatory Holding Position Signs for Runways** have **white numbering/lettering** on a **red background with a white border**. These are located at each entrance to a runway and at the edge of the runway safety area/obstacle-free zone and are co-located with runway holding position markings. **Do not proceed beyond these signs until clearance is given by the ATCT to enter onto the runway.**



**Runway Hold Sign**

**Instrument Landing System (ILS) Holding Position Signs** have **white letters** on a **red background with a white border**. These signs tell pilots and vehicle operators where to stop to avoid interrupting a type of navigational signal used by landing aircraft. This is a critical area, and a vehicle/equipment operator must remain clear of it (*use airport-specific policy*). If a vehicle proceeds past this microwave landing system/ILS marking, it may cause a false signal to be transmitted to the landing aircraft.



**ILS Hold Sign**

**Holding Position Signs for Runway Approach Areas**. The inscription on a sign for a runway approach area is the associated runway designation followed by a dash and the abbreviation APCH for approach. This sign has **white numbering** on a **red background** with a **white border**. The sign is installed on taxiways located in approach areas where an aircraft on a taxiway would either cross through the runway safety area or penetrate the airspace required for the approach or departure runway.



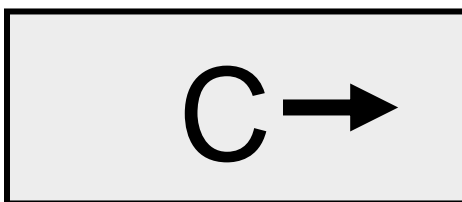
**Approach Sign**

**Runway Distance Remaining Signs** provide distance remaining information to pilots during takeoff and landing operations. They have **white numbering** on a **black background**. **The number on the sign provides the remaining runway length in 1,000-foot increments.**



**Runway Distance Remaining Signs**

**Runway Exit Sign** is a destination sign located prior to the runway/taxiway intersection on the side and in the direction of the runway where the aircraft is expected to exit. This sign has **black lettering** and a **directional arrow** on a **yellow background**.



**Runway Exit Sign**

### 3.4.4. Markings.

**Pavement markings on a runway are white.** Runway Threshold Markings and Runway Threshold Bars, Runway Aiming Point Markings, Runway Designation Markings, Runway Touchdown Zone Markings, Runway Centerline Markings, Runway Side Stripes, and Displaced Threshold Markings are white. The only nonwhite lines on a runway are yellow lead-in/-off lines that extend from the runway centerline and holdlines for a specific operation known as land and hold short.

## Section 4. Communications

**4.1.** Any vehicle driving on the **movement areas (runways and taxiways)** must be in contact with the ATCT or capable of monitoring and transmitting on the CTAF. Vehicle operators must always monitor the appropriate radio frequency when in the movement areas on controlled airports. Permission must be requested and clearance given prior to driving on a movement area. A vehicle that is equipped with a radio may escort vehicles without radios. When a movement area is closed for construction, vehicles may traverse that area without ATCT contact but must be escorted if their travels require them to cross an active movement area.

**4.2.** The ATCT controller may use separate or common radio frequency to control all ground traffic, vehicle and aircraft, on the movement areas. The frequency is only to be used to get clearance onto and off the movement areas. When the ATCT is closed, the CTAF should be used to announce a driver's intentions when operating within the movement area.

**4.3. Phraseology.** Vehicle operators must contact the ATCT ground controller each and every time they proceed onto or leave the movement area. When proceeding onto a movement area, vehicle operators must tell the controller three things: **WHO you are, WHERE you are, and WHAT your intentions are.** Vehicle operators must always acknowledge all communications so ground control and other persons know that the message was received. **Vehicle operators must always give aircraft and ground control transmissions priority unless an emergency exists.** Very high frequency frequencies are for the primary use of aircraft and ATCT personnel. Some typical transmissions are as follows:

- (AIRPORT NAME) ground control, this is Airport 21 at Charlie 6. Request permission to cross Runway 30."
- (AIRPORT NAME) ground control, this is Airport 21 at Taxiway Alpha. Request clearance south on runway 19 right for a light inspection."

Reply transmissions may be brief, such as—

- ATCT: "Airport 21, hold short of runway 19 right."
- Driver: "Airport 21 holding short of runway 19 right."
- ATCT: "Airport 21 cleared south on runway 19 right."  
"Please expedite, landing aircraft on a 10 mile final for runway 19 right."
- Driver: "Airport 21 cleared south on runway 19 right, will expedite."
- Driver: "Ground control, Airport 21 is clear of runway 19 right."

**NOTE:** If you are unsure what the controller has said, or if you don't understand an instruction, you should ask the controller to repeat it. Good communications only occur when each party knows and understands what the other is saying.

### 4.4. Common Use Phrases.

#### What Is Said:

#### What It Means:

Acknowledge

Let me know you have received and understand this message.

Advise Intentions

Let me know what you plan to do.

Affirmative	Yes.
Correction	An error has been made in the transmission, and the correct version follows.
Go Ahead	Proceed with your message only.
Hold/Hold Short	Phrase used during ground operations to keep a vehicle or aircraft within a specified area or at a specified point while awaiting further clearance from air traffic control.
How do you hear me?	Question relating to the quality of the transmission or to determine how well the transmission is being received.
Immediately or without delay	Phrase used by ATC when such action compliance is required to avoid an imminent situation.
Negative	"No" or "permission not granted" or "that is not correct."
Out	The radio conversation is ended, and no response is expected.
Over	My radio transmission is ended, and I expect a response.
Read Back	Repeat my message to me.
Roger	I have received all of your last transmission.
Stand By	Means the controller or pilot must pause for a few seconds, usually to attend to other duties of a higher priority. Also means to wait as in "stand by for clearance." The caller should reestablish contact if a delay is lengthy.
Unable	Indicates inability to comply with a specific instruction, request, or clearance.
Verify	Request confirmation of information.
Wilco	I have received your message, understand it, and will comply with it.

**4.5. Phonetic Aviation Alphabet.** Because some letters have similar sounds, like B and P, the international aviation industry uses the following words to reduce confusion. For example; Taxiway B would be referred to as Taxiway Bravo on the radio.

<b>A</b>	ALFA	<b>N</b>	NOVEMBER
<b>B</b>	BRAVO	<b>O</b>	OSCAR
<b>C</b>	CHARLIE	<b>P</b>	PAPA
<b>D</b>	DELTA	<b>Q</b>	QUEBEC
<b>E</b>	ECHO	<b>R</b>	ROMEO

<b>F</b>	FOX-TROT	<b>S</b>	SIERRA
<b>G</b>	GOLF	<b>T</b>	TANGO
<b>H</b>	HOTEL	<b>U</b>	UNIFORM
<b>I</b>	INDIA	<b>V</b>	VICTOR
<b>J</b>	JULIET	<b>W</b>	WHISKEY
<b>K</b>	KILO	<b>X</b>	X-RAY
<b>L</b>	LIMA	<b>Y</b>	YANKEE
<b>M</b>	MIKE	<b>Z</b>	ZULU

**4.6. ATCT Light Gun Signals.** Air traffic controllers have a backup system for communicating with aircraft or ground vehicles if their radios stop working. The controller has a light gun in the tower that can send out different colored lights to tell the pilot or driver what to do. If a vehicle operator experiences a radio failure on a runway or taxiway, the operator should vacate the runway as quickly and safely as possible and contact the ATCT by other means, such as a cellular telephone, and advise the ATCT of the situation. If this is not practical, then the driver, after vacating the runway, should turn the vehicle toward the tower and start flashing the vehicle headlights and wait for the controller to signal with the light gun.

Light gun signals, and their meaning, are as follows:

Steady Green	OK to cross runway or taxiway.
Steady Red	STOP!
Flashing Red	Move off the runway or taxiway.
Flashing White	Go back to where you started.
Alternating Red and Green	Use extreme caution.

**4.7. Safety.** The FAA defines runway incursion as “**Any occurrence at an airport involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take off of aircraft.**”

Runway incursions are primarily caused by error in one or more of the following areas:

- Pilot/ground vehicle/controller communications
- Airport familiarity
- Loss of situational awareness

An example of an incursion is a vehicle at an airport with an operating ATCT straying onto a runway in front of an aircraft causing the pilot to take an action to avoid a collision.

When driving on the airfield, vehicle operators need to always be aware of their location and the meaning of all pavement markings, lights, and signs. When on the aprons and taxiways, stay away and steer clear of aircraft. **Aircraft always have the right-of-way.**

**NOTE: Any individual involved in a runway incursion should receive remedial airfield driver’s training given by the (AIRPORT OPERATOR).**

*This is an appropriate place to describe an individual airport's runway and taxiway identification system. In addition to the system description, the FAA recommends that the airport operator provide a runway (RY) and taxiway (TWY) diagram, especially if the airport's identification system varies from the norm or is otherwise complicated.*

# SAMPLE

## GROUND VEHICLE OPERATING FAMILIARIZATION PROGRAM TRAINING RECORD

Employee's Name: \_\_\_\_\_

Employee's Position: \_\_\_\_\_

Company Name: \_\_\_\_\_

Social Security Number: \_\_\_\_\_

Driver's License State and Number: \_\_\_\_\_

Driver's License Expiration Date: \_\_\_\_\_

I agree to abide by all rules and regulations prescribed for the operations of a vehicle within the airport operations area.

As of this time, I certify that I hold a current and valid driver's license. If for any reason my license becomes invalid, I will notify the (AIRPORT OPERATOR) immediately.

Sign your name and indicate today's date below:

\_\_\_\_\_  
(NAME)

\_\_\_\_\_  
(DATE)

### ● ..... ● PERMITTED VEHICLE OPERATING AREAS

#### Location

- ☐ General Aviation Ramp
- ☐ Air Carrier/Terminal Ramp
- ☐ Firehouse
- ☐ Air Cargo
- ☐ Tie-downs
- ☐ General Aviation Hangars
- ☐ All Areas

*I certify that the above named individual has satisfactorily completed the Driver Training Program.*

Instructor's Signature: \_\_\_\_\_

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<b>ACCEPTANCE TESTING CHECKLIST (See Specifications for Details)</b>			
<b>MATERIAL</b>	<b>TEST(S) REQUIRED</b>	<b>FREQUENCY REQUIRED</b>	<b>FREQUENCY CONDUCTED</b>
<i>P-152 Excavation &amp; Embankment</i>	<i>Cohesive subgrade 90%, noncohesive subgrade 95% of max. density as determined by ASTM 698 <math>\pm</math> 2% of optimum moisture. Field testing by ASTM D2922</i>	<i>One per 1,000 C.Y. per lift for Embankments. One per 1,000 S.Y. for top of subgrade</i>	
	<i>12' straight edge 1/2" maximum deviation and 0.05' max. from plan grade for subgrade</i>	<i>As directed</i>	
<i>P-154 Subbase Course</i>	<i>Liquid Limit <math>\leq</math> 25, PI <math>\leq</math> 6 ASTM D4318 100% of max. density as determined by ASTM D698 or AASHTO T 99-74</i>	<i>Density on basis of one per 1,000 S.Y. per Lift,</i>	
	<i>12' Straight edge 3/8" max. deviation</i>	<i>As Directed</i>	
	<i>Thickness within 1/2" of plan thickness</i>	<i>One per 500 S.Y.</i>	
	<i>Gradations as per spec.</i>	<i>Gradation on basis of one per 1,000 C.Y. and minimum of one per each day of placement</i>	
<i>P-208 Crushed Aggregate Base Course (Aggregate)</i>	<i>LA Abrasion Wear <math>\leq</math> 50% ASTM C131</i>	<i>Once</i>	
	<i>Liquid Limit <math>\leq</math> 25, P.I. <math>\leq</math> 5, ASTM D4318 on Material Passing Number 40</i>	<i>Once</i>	
	<i>Fractured Faces 60% With 2, 75% With 1 on Material Retained on Number 4</i>	<i>Once</i>	
<i>P-208 Crushed Aggregate Base Course (Acceptance Tests)</i>	<i>100% ASTM D 698 Moisture = Sufficient to Obtain Density Gradations ASTM 117 and C136 as per Specifications and Job Mix</i>	<i>Density on a Lot basis of one days production or 2,400 S. Y. divided into 2 equal sublots  Gradations on a Lot basis of one day's production or 2,400 S. Y. divided into 2 equal sublots</i>	
<i>P-208 Crushed Aggregate Base Course (Grade Tolerance)</i>	<i>Surface tests with 12' straight edge, deviations <math>\leq</math> 3/8"</i>	<i>As Directed</i>	
<i>P-208 Crushed Aggregate Base Course (Thickness)</i>	<i>Thickness, within 1/2" of plan thickness</i>	<i>One per 300 S. Y.</i>	
<i>P-401 Plant Mix Bituminous Pavement (Aggregate)</i>	<i>Flat/Elongated Pieces <math>\leq</math> 8% ASTM D4791</i>	<i>Mix Design</i>	
	<i>Fractured Faces 50% with two, 65% with one for 50 Blow</i>	<i>Mix Design</i>	
	<i>LA Abrasion Wear <math>\leq</math> 40% ASTM C131</i>	<i>Mix Design</i>	
	<i>Course Aggregate Sodium Sulfate Loss <math>\leq</math> 12% Magnesium Sulfate Loss <math>\leq</math> 13% ASTM C88</i>	<i>Mix Design</i>	
	<i>Fine Aggregate Sodium Surface Loss <math>\leq</math> 10% Magnesium Sulfate Loss <math>\leq</math> 15% ASTM C88</i>	<i>Mix Design</i>	
	<i>Sand Equivalent value <math>\geq</math> 45 ASTM D2419</i>	<i>Mix Design</i>	
	<i>Liquid Limit <math>\leq</math> 25, P.I. <math>\leq</math> 6, ASTM D4318</i>	<i>Mix Design</i>	
<i>P-401 Plant Mix Bituminous Pavement (Bituminous Material)</i>	<i>Vendor's Certified Test Reports.</i>	<i>Once per Tankload</i>	
<i>P-401 Plant Mix Bituminous Pavement (Mix Design)</i>	<i>Marshall Mix Design Asphalt Institute's Manual Series No. 2 (MS-2), current edition and Project Specifications</i>	<i>Once if approved (Must be submitted to &amp; approved by the Engineer &amp; FAA before any paving begins on project)</i>	
<i>P-401 Plant Mix Bituminous</i>	<i>All Tests required for Bituminous Pavement</i>	<i>Once per paving project or as</i>	

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<b>MATERIAL</b>	<b>TEST(S) REQUIRED</b>	<b>FREQUENCY REQUIRED</b>	<b>FREQUENCY CONDUCTED</b>
<i>Pavement (Test Section)</i>		<i>required by Engineer</i>	
<i>P-401 Plant Mix Bituminous Pavement (Acceptance Tests and measurements)</i>	<i>See Specifications for Stability, Flow, Air Voids, Mat Density, Joint Density, Thickness, Smoothness, Grade.</i>	<i>Lot is one day's production, not to exceed 2,000 Tons, divided into 4 equal Sublots</i>	
<i>P-401 Plant Mix Bituminous Pavement (Moisture Susceptibility)</i>	<i>Tensile Strength Ratio <math>\geq 75</math> per ASTM D4867</i>	<i>Mix Design</i>	
<i>P-401 Plant Mix Bituminous Pavement (Smoothness and Grade)</i>	<i>Surface test with 12' straight edge, survey on 50' grid.</i>	<i>Lot is each day of production</i>	
<i>P-602 Bituminous Prime Coat</i>	<i>Vendor's Certified Test Report</i>	<i>Once per Tankload</i>	
<i>P-603 Bituminous Tack Coat</i>	<i>Vendor's Certified Test Report</i>	<i>Once per Tankload</i>	
<i>P-610 Structural Portland Cement Concrete</i>	<i>28 Day Strength 4000 psi min., Slump <math>\leq 4"</math> Air Content <math>5\% \pm 1</math> Vendor's Certificate for Cement.</i>	<i>Once per Pour or 50 C.Y.</i>	
<i>P-620 Runway and Taxiway Painting</i>	<i>Manufacturer's Certifications</i>	<i>Once per Shipment</i>	
<i>D-701 Pipe for Storm Drains and Culverts</i>	<i>Manufacturer's Certifications &amp; Backfill Compaction.</i>	<i>Once per shipment &amp; as per P-152</i>	
<i>T-901 Seeding</i>	<i>Vendor's Certification of Seed and Mulch Mix</i>	<i>Once per shipment</i>	
<i>L-101 Airport Rotating Beacon</i>	<i>Manufacturer's Certifications FAA AC 150/5345-53C Listed FAA AC 150/5345-12E</i>	<i>Once per Shipment &amp; Pour and as directed</i>	
<i>L-103 Airport Beacon Tower</i>	<i>Manufacturer's Certification and P-610 for Concrete</i>	<i>Once per Shipment &amp; Pour and as directed</i>	
<i>L-107 Airport 8 Foot and 12 Foot Wind Cones</i>	<i>FAA AC 150/5345-53C Listed FAA AC 150/5345-27D Manufacturer's Certifications</i>	<i>Once per shipment &amp; as directed.</i>	
<i>L-108 Airport Underground Power Cable for Airports</i>	<i>FAA AC 150/5345-53C FAA AC150/5345-7E FAA AC 150/5345-26C Manufacturer's Certification System Megger as per L-108</i>	<i>Once per Shipment and as directed</i>	
<i>L-109 Airport Regulator Vault &amp; Vault Equipment</i>	<i>FAA-AC150/5345-53C Listed, System Operational Test, Manufacturer's Certifications, FAA AC 150/5345-3F FAA AC 150/5345-5B FAA AC 150/5345-10F FAA AC 150/5345-13B FAA AC 150/5345-49C</i>	<i>Once per Shipment and as directed.</i>	
<i>L-110 Airport Underground Electrical Duct Banks and Conduits</i>	<i>P-610 for Concrete, Manufacturer's Certification for Conduits, Backfill Compaction</i>	<i>Once per Shipment and as directed</i>	
<i>L-125 Airport Lighting Systems, Guidance Signs and Edge Markers</i>	<i>FAA AC 150/5345-53C Listed FAA AC 150/5340-30D FAA AC 150/5345-39C FAA AC 150/5345-42F FAA AC 150/5345-44H FAA AC 150/5345-46C</i>	<i>Once per Shipment and as directed</i>	

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	<i>FAA 150/534—47B</i> <i>Manufacturer's Certifications, &amp; P-610 for Concrete.</i>		
<i>L-132 Precision Approach Path Indicator (PAPI-2) Systems.</i>	<i>FAA AC 150/5345-53C Listed</i> <i>FAA AC 150/5345-28F</i> <i>P-610 for Concrete, Manufacturers Certifications, Backfill Compaction, System Operational Test</i>	<i>Once per Shipment and as directed</i>	

DAILY LOG OF EARTHWORK FIELD DENSITY TESTS									
PROJECT:		LOCATION:				TEST LAB:			
AIP No.: 3-35-0049-005-2017		STANDARD PROCTOR D698 _____		NUCLEAR D2922 _____		TESTER:			
Material Tested:		MODIFIED PROCTOR D1557 _____		SAND CONE D1556 _____					
Date	Sample Number	Field Moisture Content %	Optimum Moisture %	Minimum Density Specified %	Actual Density %	Field Density PCF	Proctor Value PCF	Soil Type	Within Spec? Yes / No
NOTE: Retests must be identified and cross - referenced to original failed test.									

<b>P-152, P-154, P-208, COMPACTION ACCEPTANCE TESTS SUMMARY</b>
<b>PROJECT:</b>
<b>AIP No.: 3-35-0049-005-2017</b>

**AIP No.: 3-35-0049-005-2017**

NOTE: Retests must be identified and cross - referenced to original failed test.

**P-401 BITUMINOUS PAVEMENT (50 BLOW)**  
**ACCEPTANCE TESTS**

Project:							Paving Date:			
AIP No: 3-35-0049-005-2017							Test Lab:			
Max. Theoretical Density Lot Ave (PCF):							Tester:			
Marshall Density Lot Ave (PCF):					VMA Lot Ave:		Lot Tonnage:			
Lot Number	Sublot	Stability lbs.	Flow .01 inch	Air Voids %	Mat Density PCF	Mat Density %	Joint Density PCF	Joint Density %	Core Thickness inches	
									Mat	Joint
<b>1</b>	A									
	B									
	C									
	D									
	E									
	F									
	G									
	H									
	Lot Average X	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Sn	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!		#DIV/0!		
	L	1000	8	2.0		96.3		93.3		
	U		20	5.0						
	QL	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!		#DIV/0!		
	QU		#DIV/0!	#DIV/0!						
	PWL									
QL = (X-L) / Sn QU = (U-X) / Sn Sn = Sample standard deviation = $[(d1^2 + d2^2 + d3^2 + \dots dn^2)/n-1]^{1/2}$ d1, d2... = Deviations of the individual sample values from the average value X X = Sample average of all subplot values within a lot n = Number of sublots PWL from Table 1 in General Conditions Section 110										
Remarks:										

## P-401 BITUMINOUS PAVEMENT - GRADE ACCEPTANCE TESTS

**Date:** \_\_\_\_\_  
**Surveyor:** \_\_\_\_\_  
**Lot Size:** \_\_\_\_\_

Test Interval - Measure elevations with a level from a known benchmark every 50' longitudinally and transversely. Measurements are to be taken daily to assure construction agrees with plan elevations within the 1/2" tolerance. The Contractor shall submit all pertinent survey notes with this completed form. No single shot may exceed 3/4" or more from the planned grade.

1 Lot = 2,000 Square Yards      Tolerance =  $\pm 1/2"$  or  $\pm 0.042'$

[illegible]

### Calculate Percent of Tests Exceeding Tolerance

E = Exceeds Tolerance > 1/2" deviation from plan elevation.

$$\frac{\text{\# of E Measurements}}{\text{Total \# of Measurements}} \times 100 = \text{Percent Exceeding Tolerance}$$
$$\frac{\text{\# of E Measurements}}{\text{Total \# of Measurements}} \times 100 = \text{\#DIV/0! P.E.T.}$$

Signature of Licensed Surveyor

# P-401 BITUMINOUS PAVEMENT - GRADE ACCEPTANCE TESTS

## BITUMINOUS PAVEMENT GRADE ACCEPTANCE TESTS

**Airport Project:** Shiprock Airstrip **Date:** \_\_\_\_\_

**AIP Number:** 3-35-0049-005-2017 **Surveyor:** \_\_\_\_\_

**Lot Number:** \_\_\_\_\_ **Lot Size:** \_\_\_\_\_

**Lot Location Limits:** \_\_\_\_\_

Test Interval - Measure elevations with a level from a known benchmark every 50' longitudinally and transversely. Measurements are to be taken daily to assure construction agrees with plan elevations within the 1/2" tolerance. The Contractor shall submit all pertinent survey notes with this completed form. No single shot may exceed 3/4" or more from the planned grade.

1 Lot = 2,000 Square Yards Tolerance =  $\pm 1/2"$  or  $\pm 0.042'$

#	Location STA: or N	Offset or E	Planned Elevation	Measured Elevation	Deviation	
					Plus	Minus
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
22						
23						
24						
25						
50						

### Calculate Percent of Tests Exceeding Tolerance

E = Exceeds Tolerance > 1/2" deviation from plan elevation.

# of E Measurements \_\_\_\_\_ x 100 = **Percent Exceeding Tolerance**  
Total # of Measurements

# of E Measurements = \_\_\_\_\_ x 100 = **####** **P.E.T.** \_\_\_\_\_ Signature Licensed Surveyor

## P-401 BITUMINOUS PAVEMENT SMOOTHNESS ACCEPTANCE TESTS

<b>Airport Project:</b>	<u>Shiprock Airstrip</u>
<b>AIP Number:</b>	<u>3-35-0049-005-2017</u>
<b>Lot Number:</b>	<u></u>
<b>Lot Location Limits:</b>	<u></u>

**Date:** \_\_\_\_\_  
**Tester:** \_\_\_\_\_  
**Lot Size:** \_\_\_\_\_

Test Interval - Measure every 50' using a 16' straightedge. Read both parallel and perpendicular to the direction of paving. Measurements are to be taken daily and the procedure witnessed by the Resident Inspector. Measure and record all deviations "E" which exceed 1/4" and all acceptable measurements "A".

[illegible]

### Calculate Percent of Tests Exceeding Tolerance

E = Exceeds Tolerance > 1/4" deviation from plan elevation.

$$\frac{\text{\# of E Measurements}}{\text{Total \# of Measurements}} \times 100 = \text{Percent Exceeding Tolerance}$$

           x 100 = **P.E.T.**

## P-401 BITUMINOUS PAVEMENT QUALITY CONTROL TESTS

PROJECT: Shiprock Airstrip					SAMPLE DATE:	
AIP No: 3-35-0049-005-2017					TEST LAB:	
LOCATION:		TONS:			TESTER:	
Lot Number <b>1</b>	Sublot Test Results				Action Limit	Suspension Limit
	A	B	C	D		
Asphalt Content %					JMF $\pm$ 0.45% =	JMF $\pm$ 0.70% =
Gradation						
% Passing 3/4 inch					0      100	0      100
% Passing 1/2 inch					JMF $\pm$ 6% =	JMF $\pm$ 9% =
% Passing 3/8 inch					JMF $\pm$ 6% =	JMF $\pm$ 9% =
% Passing No. 4					JMF $\pm$ 6% =	JMF $\pm$ 9% =
% Passing No. 8					JMF $\pm$ 5% =	JMF $\pm$ 7.5% =
% Passing No. 16					JMF $\pm$ 5% =	JMF $\pm$ 7.5% =
% Passing No. 30					JMF $\pm$ 3% =	JMF $\pm$ 4.5% =
% Passing No. 50					JMF $\pm$ 3% =	JMF $\pm$ 4.5% =
% Passing No. 100					JMF $\pm$ 2% =	JMF $\pm$ 3% =
% Passing No. 200					JMF $\pm$ 2% =	JMF $\pm$ 3% =
Test Property	Test Results				Specification Limits	
Moisture Content of Aggregate					—	
Moisture Content of Mixture					0.5% Maximum	
Temperature of Dryer					350° F Maximum temperature of aggregate	
Temperature of Bitumen in Tank					325° F Maximum temperature	
Mix Temperature at Plant					—	
Mix Temperature at Paver					250° F Minimum	
In Place Density						
Location						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

## P-401 BITUMINOUS PAVEMENT 50 BLOW - ACCEPTANCE TESTS SUMMARY

AIRPORT: Shiprock Airstrip		COUNTY:		STATE:		AIP#: 3-35-0049-005-2017		Page:      of
		ACCEPTANCE TEST		CONTROL TEST				
Unit Price		Marshall Air Voids (%)	Mat Density (%)	Marshall Unit Wt (PCF)	VMA %	Stability (lbs)	Flow (.01 in)	Joint Density (%)
Mix                      /Ton	AC                      /Ton							
Specification		2.0 - 5.0	Target: 98%		_____ Min	1000 min	8 - 20	Target: 96%
DATE:	Lot							
LOT:	Ave							
LOCATION: Test Section	Std							
LIFT:	Dev							
% PAY:	QU							
TONS MIX:	QL							
TON AC:								
TOTAL PAY:	PWL							
DATE:	Lot							
LOT:	Ave							
LOCATION:	Std							
LIFT:	Dev							
% PAY:	QU							
TONS MIX:	QL							
TON AC:								
TOTAL PAY:	PWL							
DATE:	Lot							
LOT:	Ave							
LOCATION:	Std							
LIFT:	Dev							
% PAY:	QU							
TONS MIX:	QL							
TON AC:								
TOTAL PAY:	PWL							

## P-401 BITUMINOUS PAVEMENT 50 BLOW - ACCEPTANCE TESTS SUMMARY

AIRPORT: Shiprock Airstrip		COUNTY:		STATE:		AIP#: 3-35-0049-004-2017		Page:      of
		ACCEPTANCE TEST		CONTROL TEST				
Unit Price		Marshall Air Voids (%)	Mat Density (%)	Marshall Unit Wt (PCF)	VMA %	Stability (lbs)	Flow (.01 in)	Joint Density (%)
Mix                      /Ton								
AC                         /Ton								
Specification		2.0 - 5.0	Target: 98%		_____ Min	1800 min	8 - 20	Target: 96%
DATE:	Lot							
LOT:	Ave							
LOCATION:	Std							
LIFT:	Dev							
% PAY:	QU							
TONS MIX:	QL							
TON AC:								
TOTAL PAY:	PWL							
DATE:	Lot							
LOT:	Ave							
LOCATION:	Std							
LIFT:	Dev							
% PAY:	QU							
TONS MIX:	QL							
TON AC:								
TOTAL PAY:	PWL							
DATE:	Lot							
LOT:	Ave							
LOCATION:	Std							
LIFT:	Dev							
% PAY:	QU							
TONS MIX:	QL							
TON AC:								
TOTAL PAY:	PWL							

February 17, 2017  
ATEK Project #150133

Armstrong Consultants  
2345 S. Alma School Rd., Suite 208  
Mesa, AZ 85210

Attention: Mr. Jason Musselman, P.E., Director of Aviation Services

Re: Surface Soil Sampling and Testing  
Shiprock Airstrip Runway Improvements  
SEC of US 491 and Indian Route 36  
Shiprock, San Juan County, New Mexico

In accordance with your request and authorization, ATEK Engineering Consultants LLC (ATEK) advanced soil test borings along the Shiprock Airport Runway 2/20 located southeast of US 491 and Indian Route 36 in San Juan County, New Mexico. The purpose of this letter is to summarize our field sampling activities and present our laboratory test results.

### **Project Understanding**

The project consisted of observing asphalt surface conditions and classifying subsurface soil characteristics along Runway 2/20. The existing asphalt paved runway is approximately 5,370-feet long and geotechnical borings were advanced to establish the subsurface soil profile.

### **Field and Laboratory Testing**

ATEK performed surface soil sampling at the project site between December 12, 2016 and December 13, 2016. The soil sampling consisted of advancing twenty-seven soil borings to depths ranging from five (5) to fifteen (15) feet below the existing grade. The soil borings were advanced using CME-55 power drill rig equipped with 7 and 1/8-inch outside diameter hollow stem augers. Field borings were located at the approximate stations indicated on the attached Sample Location Plan.

Prior to the start of drilling, the New Mexico 811 center and Navajo Tribal Utility Authority was contacted to locate existing utilities at the boring locations. Upon completion of the borings, the boreholes were backfilled with excavated soil and capped with asphalt.

Soil samples obtained were tested in our laboratory. A summary of field and laboratory data is presented in the following table.

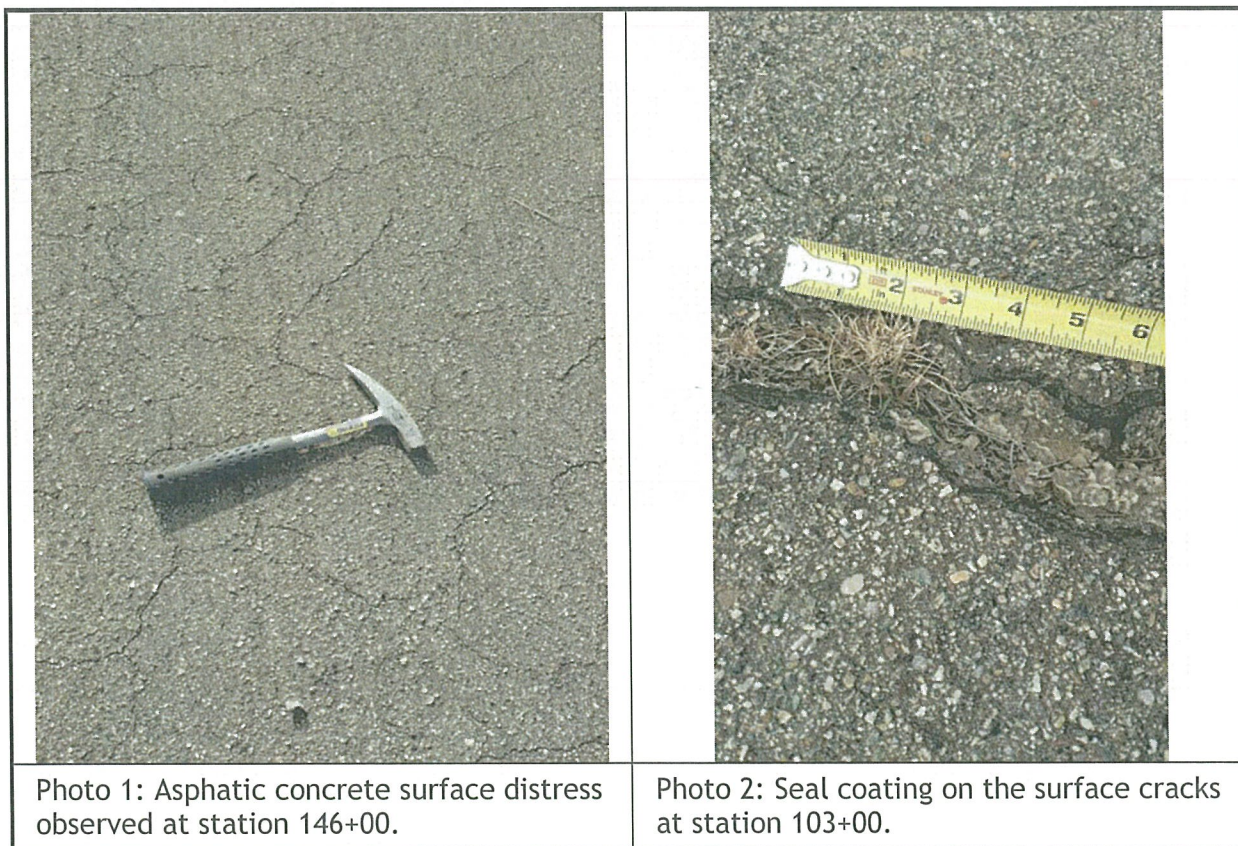
Sample Location	Asphaltic Concrete Thickness (in)	Aggregate Base Course Thickness (in)	Gradation (Percent Passing by Weight, ABC Only)						
			3"	1 1/2"	1"	No. 4	No. 8	No. 30	No. 200
B-1	2	9	100	100	100	69	57	43	9.6
B-2	2	9	100	100	96	63	53	39	11
B-3	2	9	100	100	100	72	60	43	9.8
B-4	2	8	100	100	100	85	71	55	12
B-5	2	8	100	100	100	67	58	46	16
B-6	2	8	100	100	100	67	55	40	4.1
B-7	2	8	100	100	100	79	67	52	14
B-8	2	9	100	100	100	56	47	33	9.7
B-9	3	8	100	100	100	83	70	53	13
B-10	2	9	100	100	100	82	69	53	14
B-11	2 1/2	8	100	100	100	79	66	51	10
B-12	2	8	100	100	100	78	66	51	13
B-13	2	10	100	100	100	82	68	53	14
B-14	2	7	---	---	---	---	---	---	---
B-15	2	7	---	---	---	---	---	---	---
B-16	2 1/2	8 1/2	100	100	100	68	62	42	12
B-17	2	8	100	100	100	64	55	41	12
B-18	3	7	100	100	100	77	64	49	13
B-19	2 1/2	7	100	100	100	77	64	49	13
B-20	2 1/2	8	100	100	100	82	69	53	14
B-21	2	8	---	---	---	---	---	---	---
B-22	2	3	100	100	86	61	52	39	13
B-23	2	3	---	---	---	---	---	---	---
B-24	2	6	100	100	100	81	71	58	29
B-25	3	8	---	---	---	---	---	---	---
B-26	0	0	---	---	---	---	---	---	---
B-27	2	5	---	---	---	---	---	---	---

Sample Location	Sample Depth (ft)	Atterburg Limits			Gradation (Percent Passing by Weight)		Soil Classification		
		LL	PL	PI	No. 4	No.200	USCS	AASHTO	FAA Frost Group
B-1	0-5	29	19	10	100	84	CL	A-4(7)	FG-4
B-7	0-5	32	23	9	100	82	CL	A-4(7)	FG-4
B-13	0-5	30	18	12	100	88	CL	A-6(9)	FG-4
B-19	0-5	30	17	13	99	86	CL	A-6(10)	FG-3
B-24	0-5	29	17	12	100	85	CL	A-6(9)	FG-4

### Asphaltic Concrete Conditions

The asphaltic concrete on Runway 2/20 appeared to be in fair condition at the time of our field study. The following is an analysis of the existing pavement conditions using Standard Practice for Roads and Parking Lots Pavement Condition Index, ASTM D 6433, .

The wearing surface of the runway has been sealed with a half inch chip seal. This wearing surface had low-severity slippage cracking through the runway. Deeper cracks within the asphalt appeared to have been treated with a seal coating which had failed. These cracks were filled with soil and native grasses.



The width of the asphalt cracks ranged from a quarter to one inch. The depth of the asphalt cracking appeared to be through the full depth of the asphalt section.

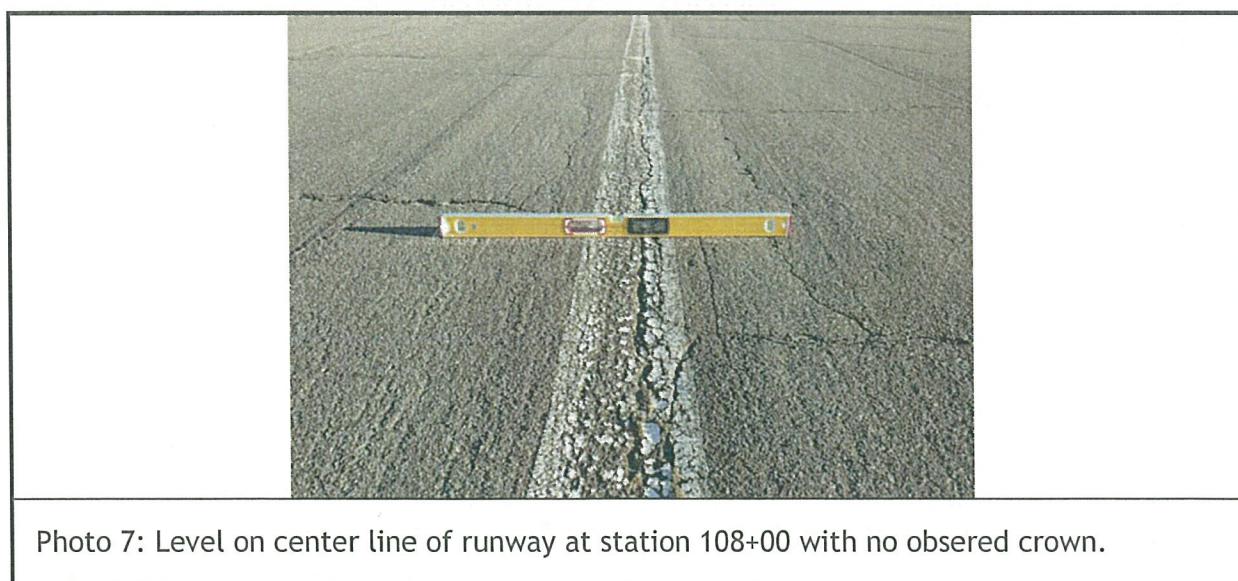
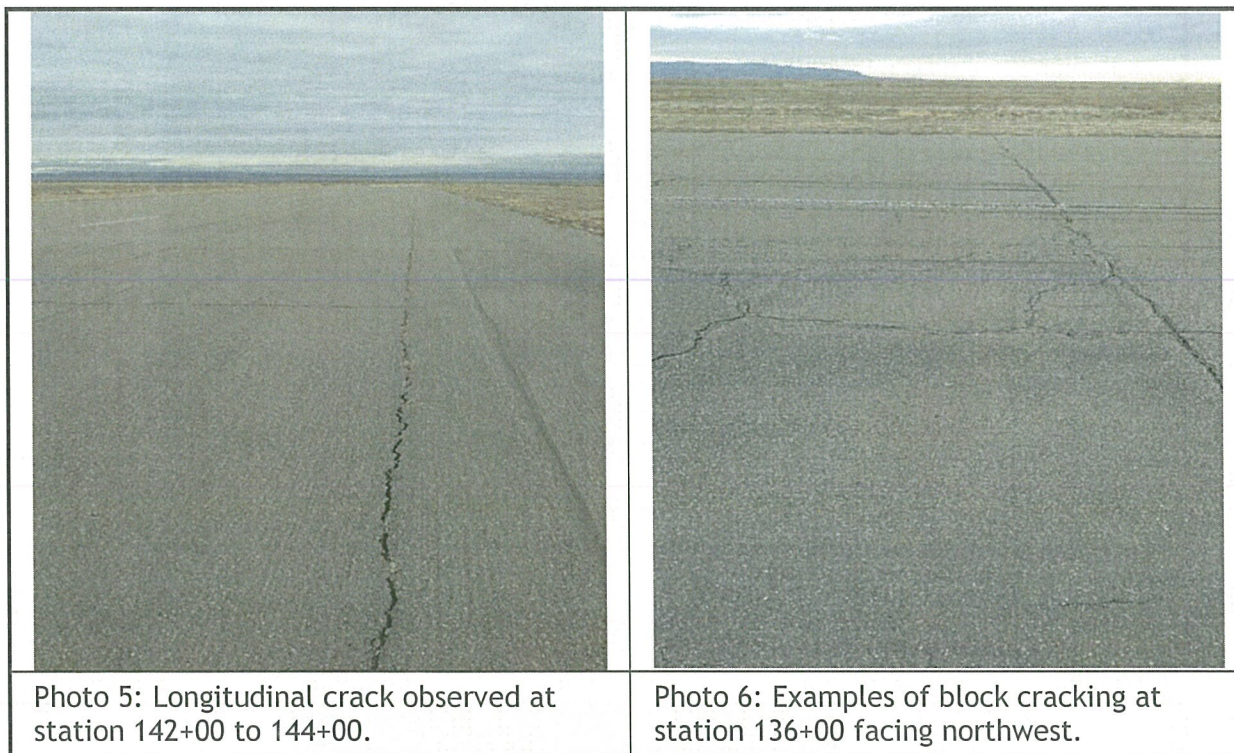


Photo 3: Width of asphaltic concrete surface crack at station 118+00.



Photo 4: Depth of asphaltic concrete surface crack at 138+00. (Note: inverted 18-inch tape measure used in photo.)

Low to medium-severity block cracking was observed throughout the surface of the asphaltic concrete, generally increasing in severity from the outer edges of the runway to the middle third. The block cracks had low to medium-severity edge cracking.



The 20 end of runway 2/20 appeared to have recent pavement improvements (approximately 370 feet in length).



Photo 8: View of Runway 2/20 indicating extent of newer pavement.

The surface of the taxi way pavement had signs of medium raveling with low to medium severity weathering.

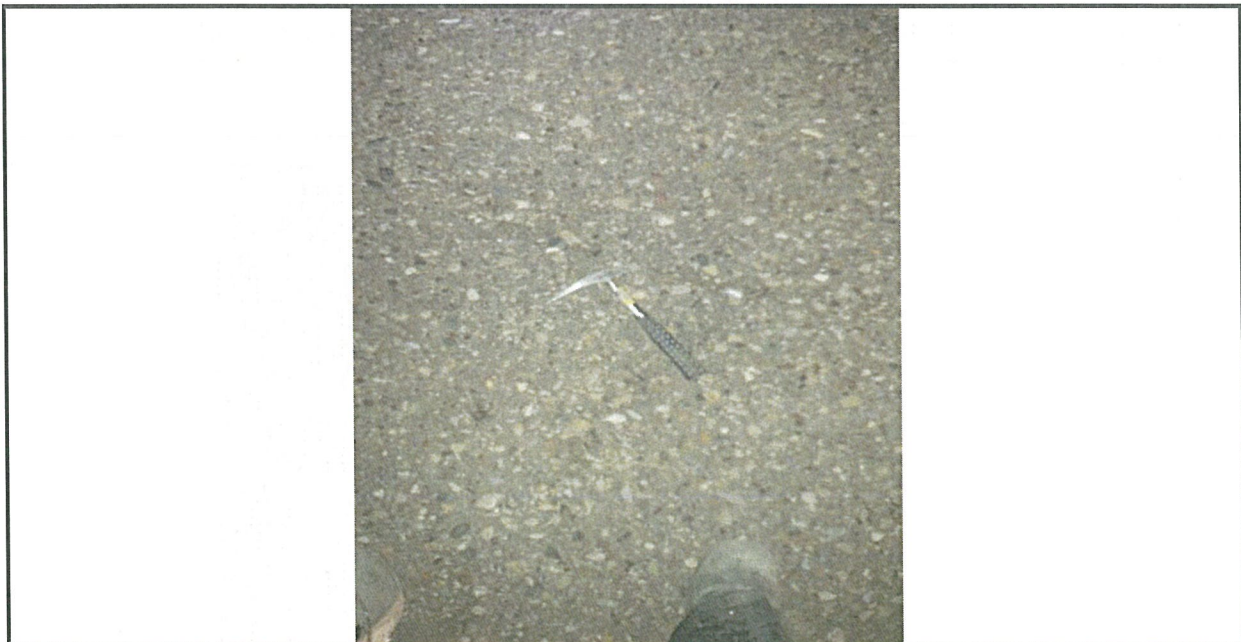
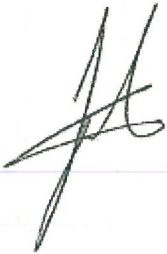


Photo 9: Raveling observed at station 120+50, 195 feet left of center line.

We appreciate the opportunity of providing our services for this project. If you have questions regarding this letter or if we may be of further assistance, please contact the undersigned.

Sincerely,  
ATEK Engineering Consultants, LLC



James P Floyd, P.E.  
Project Manager



Armando Ortega, P.E.  
Principal Geotechnical Engineer

Attached: Geotech Sketch, Soil Test Boring Logs, and Laboratory Test Results



Project Site



Site image from earth.google.com.

\*Note: not to scale.

## Site Location Map

Sheet 1 of 1



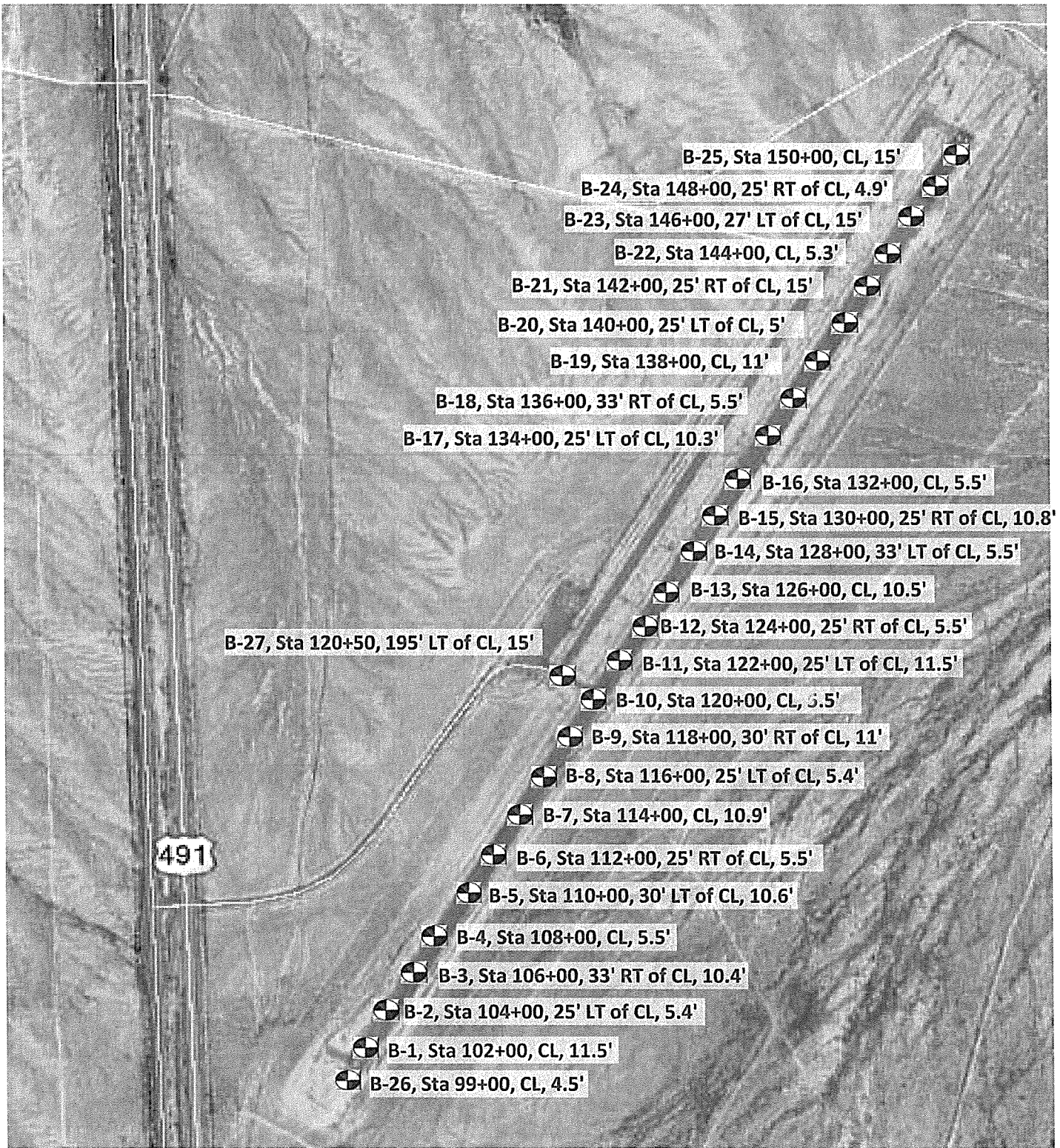
ATEK Engineering Consultants, LLC  
111 South Weber Drive, Suite 1  
Chandler, AZ 85226

Shiprock Airstrip

Project Number: 150133

Date: January 27, 2017

Drawn By: J Floyd



**Legend:**



Soil Test Boring



Site image from earth.google.com.

\*Note: Not to Scale.

## Sample Location Plan



Sheet 1 of 1

ATEK Engineering Consultants, LLC  
111 South Weber Drive, Suite 1  
Chandler, AZ 85226

### Shiprock Airstrip

Project Number:	150133
Date:	January 27, 2017
Drawn By:	J Floyd

# UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS  (More than half of material is larger than the #200 sieve)	GRAVELS  (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LESS THAN 5% PASSING NO. 200 SIEVE	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS  (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LESS THAN 5% PASSING NO. 200 SIEVE	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS  (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS  (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS  (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

Note: Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing No. 200 sieve require dual USCS symbols. (See KEY A-3 if provided)



## UNIFIED SOIL CLASSIFICATION SYSTEM

Shiprock Airstrip  
Armstrong Consultants  
Shiprock, New Mexico

Drafted By: JF  
Date: January 27, 2017

Project Number:  
150133

KEY

C-1

## LOG SYMBOLS



BULK / GRAB SAMPLE



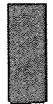
MODIFIED CALIFORNIA SAMPLER  
(2 inch inside diameter)



GRAB SAMPLE



STANDARD PENETRATION  
SPLIT SPOON SAMPLER  
(2.0-inch O.D. X 1.4-inch I.D.)



SHELBY TUBE  
(3 inch outside diameter)



NON-STANDARD PENETRATION  
SPLIT SPOON SAMPLER  
(1.5-inch O.D. X 0.9-inch I.D.)



BDBGM SIZE CORE BARREL  
(1.65-inch I.D.)



BW44 SIZE CORE BARREL  
(1.75-inch I.D.)



HQ-3 SIZE CORE BARREL  
(2.4-inch I.D.)



WATER LEVEL  
(level after completion)



WATER LEVEL  
(level where first encountered)

## GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
3. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
4. In general, the Unified Soil Classification designations presented on the logs were based on visual classification in the field, modified where appropriate by visual classifications in the office, and/or laboratory gradation and index testing.
5. NA = Not Analyzed



### LOG KEY

Shiprock Airstrip  
Armstrong Consultants  
Shiprock, New Mexico

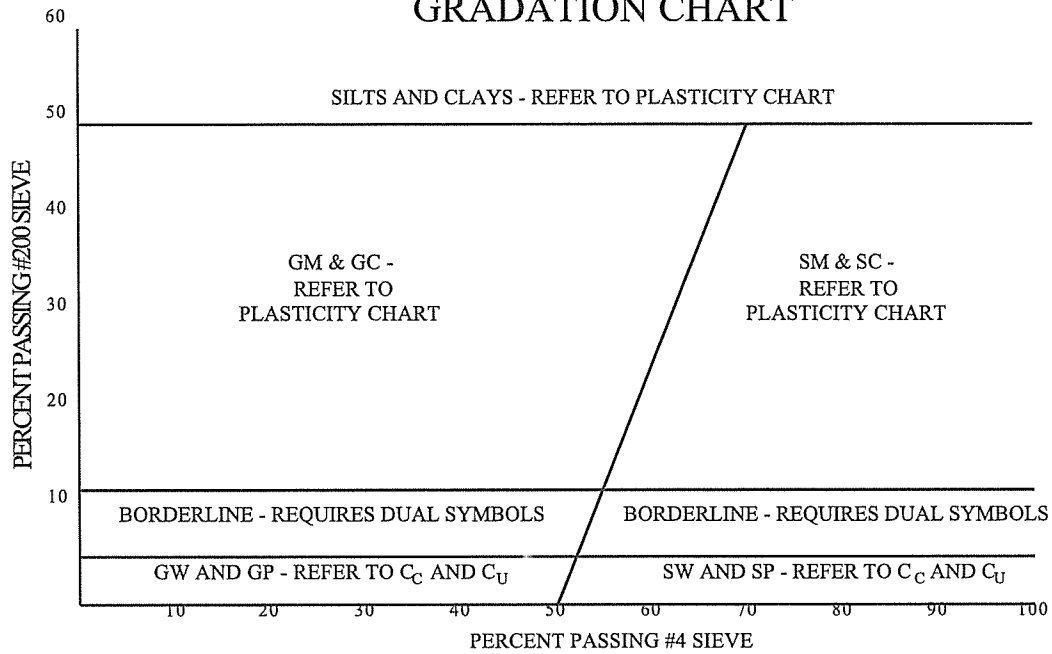
KEY

C-2

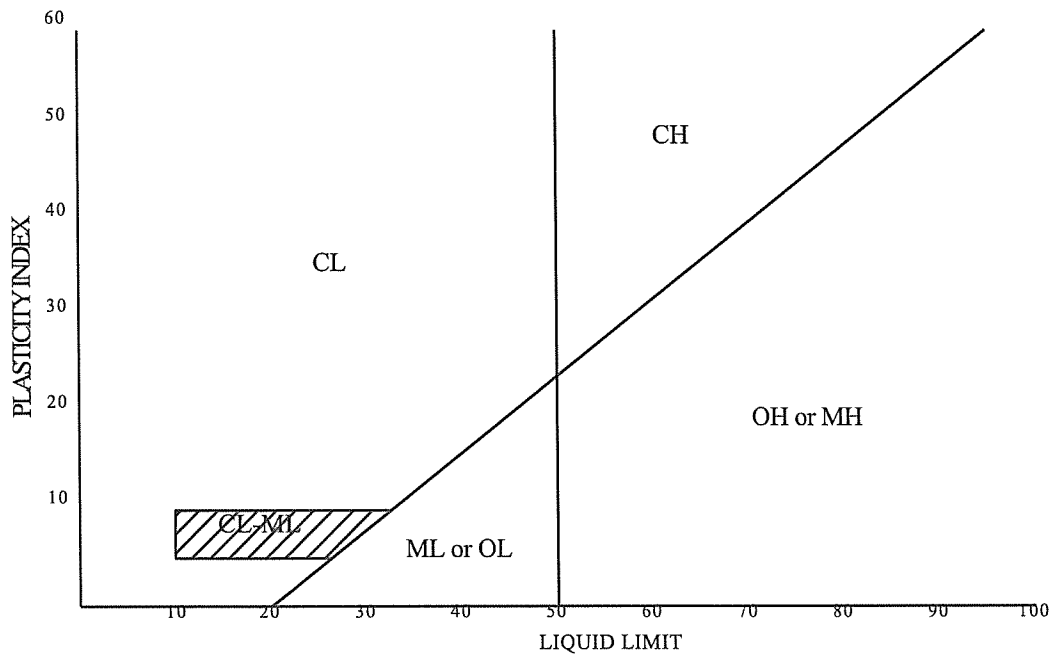
Drafted By: JF  
Date: January 27, 2017

Project Number:  
150133

## GRADATION CHART



## PLASTICITY CHART



## DEFINITIONS OF SOIL FRACTIONS

SOIL FRACTION	PARTICLE SIZE RANGE
Boulders	Greater than 300mm (12in.)
Cobbles	300mm to 75mm (12in. to 3in.)
Coarse Gravel	75mm to 19mm (3in. to 3/4in.)
Fine Gravel	19mm (3/4in.) to No. 4 sieve
Coarse Sand	No. 4 sieve to No. 10 sieve
Medium Sand	No. 10 sieve to No. 40 sieve
Fine Sand	No. 40 sieve to No. 200 sieve
Fines	less than No. 200 sieve



### CHARTS & DEFINITIONS

Shiprock Airstrip  
Armstrong Consultants  
Shiprock, New Mexico

KEY

C-3

Drafted By: JF  
Date: January 27, 2017

Project Number:  
150133

# TERMINOLOGY USED ON THE BORING LOGS TO DESCRIBE THE FIRMNESS, DENSITY, OR CONSISTENCY OF SOILS

The standard penetration resistance ( $N$ ) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Terms for description of partially saturated and/or cemented soils including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0 - 4	Very soft
5 - 8	soft
9 - 15	Moderately firm
16 - 30	Firm
31 - 50	Very firm
51+	Hard

2. Terms for description of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium dense
31 - 50	Dense
51+	Very dense

3. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency
0 - 2	Very soft
3 - 4	soft
5 - 8	Moderately stiff
9 - 15	Stiff
16 - 30	Very Stiff
31+	Hard

[illegible]



Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 106+00, 30ft right of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-3					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT			LL	PI					
0.2			5-5-22	5.3	129.6			10 SP-SM		Asphaltic Concrete (2-inches)	0.2	
0.9								ML		Sand with Silt and Gravel (SP-SM), 28% fine graded gravel, 62% coarse to fine grained sand, 10% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 9-inches)	0.9	
7.19			7-19-29	11.9	115.1			93		Silt (ML), 7% medium to fine grained sand, 93% silt, very firm, low plasticity, reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
9.44			9-44-50/2"	9.7	118.2			95				
4.5								CL		Clay (CL) with Shale nodules, 5% medium to fine grained sand, 95% clay, hard, medium plasticity, reddish brown, moist, no cementation, no reaction to HCl	4.5	
10.4			50/2"								10.4	

Bottom of boring at 10 feet bgs.  
Bottom of sampler at 10.4 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <input checked="" type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Penetrometer <input checked="" type="checkbox"/> Shelby <input checked="" type="checkbox"/> Vane Shear <input checked="" type="checkbox"/> Bulk Sample <input checked="" type="checkbox"/> California <input checked="" type="checkbox"/> Grab Sample				<b>Operation Types:</b> <input checked="" type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Auger Hollow Stem <input checked="" type="checkbox"/> Auger Solid Stem <input checked="" type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Core Barrel <input checked="" type="checkbox"/> Excavated Pit				<b>WATER LEVEL OBSERVATIONS</b> While Drilling <u>  </u> <u>N/A</u> ft    Upon Completion of Drilling <u>  </u> <u>N/A</u> Time After Drilling <u>  </u> <u>N/A</u> <u>  </u> <u>N/A</u> <u>  </u> <u>N/A</u> Depth To Water (ft) <u>  </u> <u>N/A</u> <u>  </u> <u>N/A</u> <u>  </u> <u>N/A</u> Remarks: N/A			
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ATEK Project Number:		LOG OF EXPLORATORY BORING B-3	
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150133 SHIPROCK AIRPORT RUNWAY.GPJ \* 2-7-17 \* ATEK BORING (W/REMARKS-SH#-SAME FIG#)

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 108+00 on Center Line								Sheet 1 of 1	
Borehole Number: B-4					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55				Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16		Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
0.2			4-3-7	5.5	115.1				SM		Asphaltic Concrete (2-inches)	0.2	
0.8									CL-ML		Sand with Silt and Gravel (SP-SM), 15% fine graded gravel, 73% coarse to fine grained sand, 12% silt, loose, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8-inches)	0.8	
			2-2-7	14.1	106.1						Silty Clay (CL-ML), 13% medium to fine grained sand, 87% clay and silt, moderately firm, low plasticity, light brown, moist, no cementation, no reaction to HCl (Native Material)		
4			4-16-27	11.4	119				CL		Clay (CL), 4% medium to fine grained sand, 96% clay, very firm, medium plasticity, light brown, moist, no cementation, no reaction to HCl	4	
5.5												5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <input checked="" type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Penetrometer <input checked="" type="checkbox"/> Shelby <input checked="" type="checkbox"/> Vane Shear <input checked="" type="checkbox"/> Bulk Sample <input checked="" type="checkbox"/> California <input checked="" type="checkbox"/> Grab Sample				<b>Operation Types:</b> <input checked="" type="checkbox"/> Auger Hollow Stem <input checked="" type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Auger Solid Stem <input checked="" type="checkbox"/> Core Barrel <input checked="" type="checkbox"/> Excavated Pit				<b>WATER LEVEL OBSERVATIONS</b> While Drilling <input checked="" type="checkbox"/> N/A ft    Upon Completion of Drilling <input checked="" type="checkbox"/> N/A ft Time After Drilling    N/A    N/A    N/A    N/A Depth To Water (ft)    N/A    N/A    N/A    N/A Remarks: N/A			
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ATEK Project Number: <b>150133</b>		<b>LOG OF EXPLORATORY BORING B-4</b>
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150133 SHIPROCK AIRPORT RUNWAY GPJ - 2-7-17 - ATEK BORING (W/REMARKS-SH-SAME FIG#)

Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 110+00, 30ft left of Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-5		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/13/16	Date Finished: 12/13/16

Elevation and Datum: Ground:										Notes:		
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT									
2			4-6-16	5.8	119.1			16	SM	Asphaltic Concrete (2-inches) Silty Sand (SM) with gravel, 34% fine graded gravel, 50% coarse to fine grained sand, 16% silt, loose, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8-inches) Clay (CL) with Shale nodules, 11% medium to fine grained sand, 89% clay, very firm to hard, medium to low plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)	0.2	
4			7-18-28	10.0	117.2			89	CL		0.8	
6			30-50/5"	8.9	116.4			87				
8												
10												
			39-50/2"								0.6	

Bottom of boring at 10 feet bgs.  
 Bottom of sampler at 10.6 feet bgs.  
 No groundwater encountered.

Sampler Types:	<input checked="" type="checkbox"/> Split Spoon	<input checked="" type="checkbox"/> Penetrometer	Operation Types:	<input checked="" type="checkbox"/> Auger Hollow Stem	WATER LEVEL OBSERVATIONS				
	<input checked="" type="checkbox"/> Shelby	<input checked="" type="checkbox"/> Vane Shear		<input checked="" type="checkbox"/> Mud Rotary					<input checked="" type="checkbox"/> Air Rotary
	<input checked="" type="checkbox"/> Bulk Sample	<input checked="" type="checkbox"/> California		<input checked="" type="checkbox"/> Auger Solid Stem	<input checked="" type="checkbox"/> Core Barrel	While Drilling	<u>∇</u> <u>N/A</u> ft	Upon Completion of Drilling	<u>∇</u> <u>N/A</u>
	<input checked="" type="checkbox"/> Grab Sample			<input checked="" type="checkbox"/> Excavated Pit		Time After Drilling	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
					Depth To Water (ft)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
					Remarks: N/A				

150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (WIREMARKS-SH#-SAME FIG#)

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 112+00, 25ft right of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-6					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
0.2			6-6-18	4.9	118.2				SP		Asphaltic Concrete (2-inches)	0.2	
0.8									CL		Sand (SP) with gravel, 33% fine graded gravel, 63% coarse to fine grained sand, 4% fines, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8-inches)	0.8	
			6-10-13	11.5	121.6				97		Clay (CL), 3% fine grained sand, 97% clay, firm, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
4			6-9-10	11.9	118.5				95			5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

Sampler Types:		Split Spoon		Penetrometer	Operation Types:		Auger Hollow Stem	WATER LEVEL OBSERVATIONS			
		Shelby		Vane Shear			Air Rotary				
		Bulk Sample		California			Mud Rotary		Core Barrel		
		Grab Sample					Auger Solid Stem		Excavated Pit		

While Drilling	N/A	ft	Upon Completion of Drilling	N/A	ft
Time After Drilling	N/A		N/A	N/A	
Depth To Water (ft)	N/A		N/A	N/A	
Remarks:	N/A				

150133 SHIPROCK AIRPORT RUNWAY GPJ 2-7-17 ATEK BORING (W/REMARKS-SH-SAME FIG#)



Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 116+00, 25ft left of Center Line								Sheet 1 of 1	
Borehole Number: B-8					Driller: GeoMat		Logger: J Floyd		
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16		Date Finished: 12/13/16		
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
0.2			7-4-8	4.6	117.8				SP-SM		Asphaltic Concrete (2-inches)	0.2	
0.9									CL		Sand with Silt and Gravel (SP-SM), 44% fine graded gravel, 46% coarse to fine grained sand, 10% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 9-inches)	0.9	
			5-8-11	9.6	92.1						Clay (CL), 2% fine grained sand, 98% clay, firm to hard, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
5.4			8-32-50/5"	9.9	114.6							5.4	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.4 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;">  Split Spoon   Shelby   Bulk Sample   Grab Sample </div> <div style="width: 50%;">  Penetrometer   Vane Shear   California </div> </div>				<b>Operation Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;">  Mud Rotary   Auger Solid Stem </div> <div style="width: 50%;">  Auger Hollow Stem   Air Rotary   Core Barrel   Excavated Pit </div> </div>				<b>WATER LEVEL OBSERVATIONS</b> <table style="width:100%; border-collapse: collapse;"> <tr> <td>While Drilling</td> <td>▽</td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td>▽</td> <td>N/A</td> <td>ft</td> </tr> <tr> <td>Time After Drilling</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td>Depth To Water (ft)</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td colspan="8">Remarks: N/A</td> </tr> </table>				While Drilling	▽	N/A	ft	Upon Completion of Drilling	▽	N/A	ft	Time After Drilling		N/A				N/A		Depth To Water (ft)		N/A				N/A		Remarks: N/A							
While Drilling	▽	N/A	ft	Upon Completion of Drilling	▽	N/A	ft																																				
Time After Drilling		N/A				N/A																																					
Depth To Water (ft)		N/A				N/A																																					
Remarks: N/A																																											

ATEK Project Number: <div style="border: 1px solid black; padding: 5px; text-align: center; font-weight: bold;">150133</div>	 ENGINEERING CONSULTANTS	LOG OF EXPLORATORY BORING B-8
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Project Name:							Shiprock Airstrip																																																																																																																																																																														
Borehole Location:									Sta. 118+00, 30ft left of Center Line																																																																																																																																																																												
Sheet													1 of 1																																																																																																																																																																								
Borehole Number:							B-9				Driller:				GeoMat				Logger:				J Floyd																																																																																																																																																														
Drilling Equipment:							CME - 55				Borehole Diameter (in.):				6 5/8 HSA				Date Started:				12/13/16				Date Finished:				12/13/16																																																																																																																																																						
Elevation and Datum:														Ground:														Notes:																																																																																																																																																									
DEPTH (ft)														DRILL OPERATION														SAMPLE														STANDARD PENETRATION TEST														MOISTURE CONTENT (%)														DRY DENSITY (pcf)														LIQUID LIMIT														PLASTICITY INDEX														USCS CLASSIFICATION														GRAPHIC LOG														MATERIAL DESCRIPTION														DEPTH (ft)														REMARKS													
Asphaltic Concrete (3-inches)														CL														SM														Silty Sand (SM) with gravel, 17% fine graded gravel, 70% coarse to fine grained sand, 13% silt, medium dense, non plasticity, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 9-inches)														CLAY (CL) with Shale nodules, 2% medium to fine grained sand, 98% clay, firm to hard, medium plasticity, reddish brown to purple, moist, no cementation, no reaction to HCl (Native Material)														Bottom of boring at 10 feet bgs. Bottom of sampler at 11 feet bgs. No groundwater encountered.																																																																																																															
Split Spoon														Penetrometer														Operation Types:														Auger Hollow Stem														WATER LEVEL OBSERVATIONS																																																																																																																													
Shelby														Vane Shear														Air Rotary														While Drilling														N/A ft														Upon Completion of Drilling														N/A																																																																																																	
Bulk Sample														California														Core Barrel														Time After Drilling														N/A														N/A														N/A														N/A																																																																																			
Grab Sample																												Excavated Pit														Depth To Water (ft)														N/A														N/A														N/A														N/A																																																																																			
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ATEK Project Number:														150133														LOG OF EXPLORATORY BORING B-9																																																																																																																																																									

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 120+00 on Center Line								Sheet 1 of 1	
Borehole Number: B-10					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
2			4-4-6	4.7	122.1				SM		Asphaltic Concrete (2-inches)	0.2	
									CL		Silty Sand (SM) with gravel, 18% fine graded gravel, 68% coarse to fine grained sand, 14% silt, loose, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 9-inches)	0.9	
4			2-4-5	15.3	101.8				94		Clay (CL), 6% medium to fine grained sand, 94% clay, moderately firm to firm, medium plasticity, reddish brown to purple, moist, no cementation, no reaction to HCl (Native Material)		
			4-10-17	15.0	110.2				94				
												5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby  <input type="checkbox"/> Bulk Sample  <input type="checkbox"/> Grab Sample         </div> <div style="width: 50%;"> <input type="checkbox"/> Penetrometer  <input type="checkbox"/> Vane Shear  <input type="checkbox"/> California         </div> </div>				<b>Operation Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Mud Rotary  <input type="checkbox"/> Auger Solid Stem         </div> <div style="width: 50%;"> <input type="checkbox"/> Auger Hollow Stem  <input type="checkbox"/> Air Rotary  <input type="checkbox"/> Core Barrel  <input type="checkbox"/> Excavated Pit         </div> </div>				<b>WATER LEVEL OBSERVATIONS</b> <table style="width:100%; border-collapse: collapse;"> <tr> <td>While Drilling</td> <td>▽</td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td>▽</td> <td>N/A</td> <td>ft</td> </tr> <tr> <td>Time After Drilling</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td>Depth To Water (ft)</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td>Remarks:</td> <td colspan="7">N/A</td> </tr> </table>				While Drilling	▽	N/A	ft	Upon Completion of Drilling	▽	N/A	ft	Time After Drilling		N/A				N/A		Depth To Water (ft)		N/A				N/A		Remarks:	N/A						
While Drilling	▽	N/A	ft	Upon Completion of Drilling	▽	N/A	ft																																				
Time After Drilling		N/A				N/A																																					
Depth To Water (ft)		N/A				N/A																																					
Remarks:	N/A																																										

ATEK Project Number: <b>150133</b>	 ENGINEERING CONSULTANTS	LOG OF EXPLORATORY BORING B-10
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150133 SHIPROCK AIRSTRIP RUNWAY.GPJ - 2-7-17 - ATEK BORING (W/REMARKS-SH-SAME FIG#)

[illegible]

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 124+00, 25ft right of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-12					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
2			4-7-10	6.5	124.5				SM		Asphaltic Concrete (2-inches)	0.2	
									CL		Silty Sand (SM) with gravel, 22% fine graded gravel, 65% coarse to fine grained sand, 13% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8-inches)	0.8	
4			3-7-7	15.5	106.7						Clay (CL), 6% medium to fine grained sand, 94% clay, moderately firm to very firm, medium plasticity, reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
			4-11-22	15.7	114.9								
												5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input checked="" type="checkbox"/> Shelby  <input checked="" type="checkbox"/> Bulk Sample  <input checked="" type="checkbox"/> Grab Sample         </div> <div style="width: 50%;"> <input checked="" type="checkbox"/> Penetrometer  <input checked="" type="checkbox"/> Vane Shear  <input checked="" type="checkbox"/> California         </div> </div>				<b>Operation Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Mud Rotary  <input checked="" type="checkbox"/> Auger Solid Stem         </div> <div style="width: 50%;"> <input checked="" type="checkbox"/> Auger Hollow Stem  <input checked="" type="checkbox"/> Air Rotary  <input checked="" type="checkbox"/> Core Barrel  <input checked="" type="checkbox"/> Excavated Pit         </div> </div>				<b>WATER LEVEL OBSERVATIONS</b> <table style="width: 100%;"> <tr> <td>While Drilling</td> <td><input checked="" type="checkbox"/> N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td><input checked="" type="checkbox"/> N/A</td> <td>ft</td> </tr> <tr> <td>Time After Drilling</td> <td>N/A</td> <td></td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Depth To Water (ft)</td> <td>N/A</td> <td></td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td colspan="6">Remarks: N/A</td> </tr> </table>				While Drilling	<input checked="" type="checkbox"/> N/A	ft	Upon Completion of Drilling	<input checked="" type="checkbox"/> N/A	ft	Time After Drilling	N/A		N/A	N/A	N/A	Depth To Water (ft)	N/A		N/A	N/A	N/A	Remarks: N/A					
While Drilling	<input checked="" type="checkbox"/> N/A	ft	Upon Completion of Drilling	<input checked="" type="checkbox"/> N/A	ft																														
Time After Drilling	N/A		N/A	N/A	N/A																														
Depth To Water (ft)	N/A		N/A	N/A	N/A																														
Remarks: N/A																																			

ATEK Project Number: <b>150133</b>		LOG OF EXPLORATORY BORING B-12
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150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (W/REMARKS-SH#-SAME FIG#)

Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 126+00 on Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-13		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/13/16	Date Finished: 12/13/16

Elevation and Datum: Ground:										Notes:			
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT			LL	PI						
2			7-4-4	4.7 5.2	116.5	30	12	88 14	SM  CL		Asphaltic Concrete (2-inches)	0.2	
4			3-6-7	12.0	99.6			61			Silty Sand (SM) with gravel, 18% fine graded gravel, 68% coarse to fine grained sand, 14% silt, loose, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 10-inches)		
6			4-7-17	15.7	117.6			94			Sandy Clay (CL), 5% fine graded gravel, 34% coarse to fine grained sand, 61% clay, moderately firm to firm to hard, low to medium plasticity, reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
8													
10													
			50/6"									10.5	

Bottom of boring at 10 feet bgs.  
 Bottom of sampler at 10.5 feet bgs.  
 No groundwater encountered.

150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (W/REMARKS-SH#-SAME FIG#)

Sampler Types:	<input checked="" type="checkbox"/> Split Spoon	<input checked="" type="checkbox"/> Penetrometer	Operation Types:	<input checked="" type="checkbox"/> Auger Hollow Stem	WATER LEVEL OBSERVATIONS					
	<input checked="" type="checkbox"/> Shelby	<input checked="" type="checkbox"/> Vane Shear		<input checked="" type="checkbox"/> Mud Rotary	<input checked="" type="checkbox"/> Air Rotary	While Drilling	<u>∇</u> <u>N/A</u> ft	Upon Completion of Drilling	<u>∇</u> <u>N/A</u>	
	<input checked="" type="checkbox"/> Bulk Sample	<input checked="" type="checkbox"/> California		<input checked="" type="checkbox"/> Auger Solid Stem	<input checked="" type="checkbox"/> Core Barrel	Time After Drilling	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	<input checked="" type="checkbox"/> Grab Sample			<input checked="" type="checkbox"/> Excavated Pit		Depth To Water (ft)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
					Remarks: N/A					

ATEK Project Number:		<b>LOG OF EXPLORATORY BORING B-13</b>	
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Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 128+00, 33ft left of Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-14		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/13/16	Date Finished: 12/13/16

Elevation and Datum: Ground:										Notes:			
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	-200 (%)	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT										
2			5-6-8	14.2	116.6			73	CL		Asphaltic Concrete (2-inches)	0.2	
											Aggregate Base Course (7-inches)	0.8	
4			5-13-21	10.2	124.1			98			Clay with Sand (CL), 5% fine graded gravel, 22% coarse to fine grained sand, 73% clay, moderately firm to very firm to hard, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
	5-30-50/6"	9.7	124.1			95							
												5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

Sampler Types:	<input checked="" type="checkbox"/> Split Spoon	<input checked="" type="checkbox"/> Penetrometer	Operation Types:	<input checked="" type="checkbox"/> Auger Hollow Stem	WATER LEVEL OBSERVATIONS				
	<input checked="" type="checkbox"/> Shelby	<input checked="" type="checkbox"/> Vane Shear		<input checked="" type="checkbox"/> Mud Rotary	<input checked="" type="checkbox"/> Air Rotary	While Drilling	<u>∇</u> N/A ft	Upon Completion of Drilling	<u>∇</u> N/A ft
	<input checked="" type="checkbox"/> Bulk Sample	<input checked="" type="checkbox"/> California		<input checked="" type="checkbox"/> Auger Solid Stem	<input checked="" type="checkbox"/> Core Barrel	Time After Drilling	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	<input checked="" type="checkbox"/> Grab Sample			<input checked="" type="checkbox"/> Excavated Pit		Depth To Water (ft)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
					Remarks: N/A				

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 130+00, 25ft right of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-15					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT			LL	PI					
2			5-6-8	11.3	118.6			90		Asphaltic Concrete (2-inches)	0.2	
										Aggregate Base Course (7-inches)	0.8	
			Silty Clay (CL-ML), 10% coarse to fine grained sand, 90% clay, moderately firm to firm to hard, low to medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)									
4			5-8-14	12.1	121.4			97				
6			10-37-43	10.6	123.7			98				
8												
10			47-50/3"								10.8	

Bottom of boring at 10 feet bgs.  
Bottom of sampler at 10.8 feet bgs.  
No groundwater encountered.

150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (W/REMARKS-SH#-SAME FIG#)

Sampler Types:	<input checked="" type="checkbox"/> Split Spoon	<input checked="" type="checkbox"/> Penetrometer	Operation Types:	<input checked="" type="checkbox"/> Auger Hollow Stem	WATER LEVEL OBSERVATIONS					
	<input checked="" type="checkbox"/> Shelby	<input checked="" type="checkbox"/> Vane Shear		<input checked="" type="checkbox"/> Mud Rotary	<input checked="" type="checkbox"/> Air Rotary	While Drilling	<u>∇</u> N/A ft	Upon Completion of Drilling		
	<input checked="" type="checkbox"/> Bulk Sample	<input checked="" type="checkbox"/> California		<input checked="" type="checkbox"/> Auger Solid Stem	<input checked="" type="checkbox"/> Core Barrel	Time After Drilling	<u>∇</u> N/A	<u>∇</u> N/A	<u>∇</u> N/A	<u>∇</u> N/A
	<input checked="" type="checkbox"/> Grab Sample			<input checked="" type="checkbox"/> Excavated Pit		Depth To Water (ft)	<u>∇</u> N/A	<u>∇</u> N/A	<u>∇</u> N/A	<u>∇</u> N/A
					Remarks: N/A					

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 132+00 on Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-16					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
			SPT										
2			4-5-6	4.6	116.8				12 SM		Asphaltic Concrete (2.5-inches)	0.2	
									CL		Silty Sand (SM) with gravel, 32% fine graded gravel, 56% coarse to fine grained sand, 12% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8.5-inches)	0.9	
4			4-8-12	14.6	112.3				94		Clay (CL), 6% medium to fine grained sand, 94% clay, firm, medium plasticity, reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
			5-10-19	13.3	121.1				98				
												5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <input checked="" type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Penetrometer <input checked="" type="checkbox"/> Shelby <input checked="" type="checkbox"/> Vane Shear <input checked="" type="checkbox"/> Bulk Sample <input checked="" type="checkbox"/> California <input checked="" type="checkbox"/> Grab Sample				<b>Operation Types:</b> <input checked="" type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Auger Hollow Stem <input checked="" type="checkbox"/> Auger Solid Stem <input checked="" type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Core Barrel <input checked="" type="checkbox"/> Excavated Pit				<b>WATER LEVEL OBSERVATIONS</b> While Drilling <input checked="" type="checkbox"/> N/A ft    Upon Completion of Drilling <input checked="" type="checkbox"/> N/A ft Time After Drilling    N/A    N/A    N/A    N/A Depth To Water (ft)    N/A    N/A    N/A    N/A Remarks: N/A			
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ATEK Project Number: <b>150133</b>		<b>LOG OF EXPLORATORY BORING B-16</b>	
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150133 SHIPROCK AIRPORT RUNWAY.GPJ - 2-7-17 - ATEK BORING (W/REMARKS-SH-SAME FIG#)

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 134+00, 25ft left of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-17					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	-200 (%)	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT			LL	PI						
0.2			5-5-8	4.7	118.9			12	SM		Asphaltic Concrete (2-inches)	0.2	
0.8									CL		Silty Sand (SM) with gravel, 36% fine graded gravel, 52% coarse to fine grained sand, 12% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8-inches)	0.8	
			8-12-16	12.5	119.8			95			Clay (CL), 5% medium to fine grained sand, 95% clay, firm to hard, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
4			18-38-50/2"	11	125.9			96					
10			50/4"									10.3	
Bottom of boring at 10 feet bgs. Bottom of sampler at 10.3 feet bgs. No groundwater encountered.													

<b>Sampler Types:</b> <input checked="" type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Penetrometer <input checked="" type="checkbox"/> Shelby <input checked="" type="checkbox"/> Vane Shear <input checked="" type="checkbox"/> Bulk Sample <input checked="" type="checkbox"/> California <input checked="" type="checkbox"/> Grab Sample				<b>Operation Types:</b> <input checked="" type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Auger Hollow Stem <input checked="" type="checkbox"/> Auger Solid Stem <input checked="" type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Excavated Pit				<b>WATER LEVEL OBSERVATIONS</b> <table style="width: 100%;"> <tr> <td>While Drilling</td> <td><u>  </u> N/A ft</td> <td>Upon Completion of Drilling</td> <td><u>  </u> N/A</td> </tr> <tr> <td>Time After Drilling</td> <td><u>  </u> N/A</td> <td><u>  </u> N/A</td> <td><u>  </u> N/A</td> </tr> <tr> <td>Depth To Water (ft)</td> <td><u>  </u> N/A</td> <td><u>  </u> N/A</td> <td><u>  </u> N/A</td> </tr> <tr> <td colspan="4">Remarks: N/A</td> </tr> </table>				While Drilling	<u>  </u> N/A ft	Upon Completion of Drilling	<u>  </u> N/A	Time After Drilling	<u>  </u> N/A	<u>  </u> N/A	<u>  </u> N/A	Depth To Water (ft)	<u>  </u> N/A	<u>  </u> N/A	<u>  </u> N/A	Remarks: N/A			
While Drilling	<u>  </u> N/A ft	Upon Completion of Drilling	<u>  </u> N/A																								
Time After Drilling	<u>  </u> N/A	<u>  </u> N/A	<u>  </u> N/A																								
Depth To Water (ft)	<u>  </u> N/A	<u>  </u> N/A	<u>  </u> N/A																								
Remarks: N/A																											

ATEK Project Number: <div style="font-size: 1.2em; font-weight: bold;">150133</div>		LOG OF EXPLORATORY BORING B-17
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150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (W/REMARKS.SHEET#-SAME FIG#)

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 136+00, 30ft right of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-18					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/13/16			Date Finished: 12/13/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
0.3			8-6-8	5.0	97.1				13 SM		Asphaltic Concrete (3-inches)	0.3	
0.8									CL		Silty Sand (SM) with gravel, 23% fine graded gravel, 64% coarse to fine grained sand, 13% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 7-inches)	0.8	
			3-4-6	16.2	107.6				94		Clay (CL), 6% medium to fine grained sand, 94% clay, moderately firm, low plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
4			9-10-46	12.1	115.2				96 CL-ML		Silty Clay (CL-ML), 4% medium to fine grained sand, 96% clay and silt, hard, low plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl	4	
5.5												5.5	

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 5.5 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby  <input type="checkbox"/> Bulk Sample  <input type="checkbox"/> Grab Sample         </div> <div style="width: 50%;"> <input type="checkbox"/> Penetrometer  <input type="checkbox"/> Vane Shear  <input type="checkbox"/> California         </div> </div>				<b>Operation Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Mud Rotary  <input type="checkbox"/> Auger Solid Stem         </div> <div style="width: 50%;"> <input type="checkbox"/> Auger Hollow Stem  <input type="checkbox"/> Air Rotary  <input type="checkbox"/> Core Barrel  <input type="checkbox"/> Excavated Pit         </div> </div>				<b>WATER LEVEL OBSERVATIONS</b> <table style="width: 100%;"> <tr> <td>While Drilling</td> <td><u>▽</u></td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td><u>▽</u></td> <td>N/A</td> <td>ft</td> </tr> <tr> <td>Time After Drilling</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td>Depth To Water (ft)</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td>Remarks:</td> <td colspan="7">N/A</td> </tr> </table>				While Drilling	<u>▽</u>	N/A	ft	Upon Completion of Drilling	<u>▽</u>	N/A	ft	Time After Drilling		N/A				N/A		Depth To Water (ft)		N/A				N/A		Remarks:	N/A						
While Drilling	<u>▽</u>	N/A	ft	Upon Completion of Drilling	<u>▽</u>	N/A	ft																																				
Time After Drilling		N/A				N/A																																					
Depth To Water (ft)		N/A				N/A																																					
Remarks:	N/A																																										

ATEK Project Number: <b>150133</b>		LOG OF EXPLORATORY BORING B-18	
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150133 SHIPROCK AIRSTRIP RUNWAY GPJ - 2-7-17 - ATEK BORING (WIREMARKS-SH-SAME FIG#)

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 138+00 on Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-19					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55				Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/12/16		Date Finished: 12/12/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX		USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT			LL	PI	-200 (%)						
2			3-2-1	6.5 5.5	120.4	30	13	86 13		SM CL		Asphaltic Concrete (2.5-inches)	0.2	
												Silty Sand (SM) with gravel, 23% fine graded gravel, 64% coarse to fine grained sand, 13% silt, very loose, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 7-inches)	0.8	
												Clay (CL), 5% medium to fine grained sand, 95% clay, firm to hard, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
4			4-6-10	14.5	115.6			95						
6			26-50/5"	8.7	128.2			96						
8														
10			27-50/6"											
													11	



Bottom of boring at 10 feet bgs.  
Bottom of sampler at 11 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <input checked="" type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Penetrometer <input checked="" type="checkbox"/> Shelby <input checked="" type="checkbox"/> Vane Shear <input checked="" type="checkbox"/> Bulk Sample <input checked="" type="checkbox"/> California <input checked="" type="checkbox"/> Grab Sample				<b>Operation Types:</b> <input checked="" type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Auger Hollow Stem <input checked="" type="checkbox"/> Auger Solid Stem <input checked="" type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Core Barrel <input checked="" type="checkbox"/> Excavated Pit				<b>WATER LEVEL OBSERVATIONS</b> <table style="width:100%;"> <tr> <td>While Drilling</td> <td><u>  </u></td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td><u>  </u></td> <td>N/A</td> </tr> <tr> <td>Time After Drilling</td> <td><u>  </u></td> <td>N/A</td> <td></td> <td><u>  </u></td> <td>N/A</td> <td></td> </tr> <tr> <td>Depth To Water (ft)</td> <td><u>  </u></td> <td>N/A</td> <td></td> <td><u>  </u></td> <td>N/A</td> <td></td> </tr> </table>				While Drilling	<u>  </u>	N/A	ft	Upon Completion of Drilling	<u>  </u>	N/A	Time After Drilling	<u>  </u>	N/A		<u>  </u>	N/A		Depth To Water (ft)	<u>  </u>	N/A		<u>  </u>	N/A	
While Drilling	<u>  </u>	N/A	ft	Upon Completion of Drilling	<u>  </u>	N/A																										
Time After Drilling	<u>  </u>	N/A		<u>  </u>	N/A																											
Depth To Water (ft)	<u>  </u>	N/A		<u>  </u>	N/A																											
ATEK Project Number: <b>150133</b>								<b>LOG OF EXPLORATORY BORING B-19</b>																								

150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (W/REMARKS-SH#-SAME FIG#)

Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 140+00, 25ft left of Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-20		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/12/16	Date Finished: 12/12/16

Elevation and Datum: Ground:										Notes:			
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	-200 (%)	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
2			8-6-10	5.6	125.4			14	SM		Asphaltic Concrete (2.5-inches)	0.2	
									CL		Silty Sand (SM) with gravel, 18% fine graded gravel, 68% coarse to fine grained sand, 14% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 8-inches)	0.9	
4			2-4-8	19.5	113			96			Clay (CL), 4% medium to fine grained sand, 96% clay, moderately firm to hard, low plasticity, dark brown to tan to purple, moist, no cementation, no reaction to HCl (Native Material)		
			27-50/6"	7.9	123.3			95					

Bottom of boring at 4 feet bgs.  
 Bottom of sampler at 5 feet bgs.  
 No groundwater encountered.

Sampler Types: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input checked="" type="checkbox"/> Shelby  <input checked="" type="checkbox"/> Bulk Sample  <input checked="" type="checkbox"/> Grab Sample         </div> <div style="width: 50%;"> <input checked="" type="checkbox"/> Penetrometer  <input checked="" type="checkbox"/> Vane Shear  <input checked="" type="checkbox"/> California         </div> </div>	Operation Types: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Mud Rotary  <input checked="" type="checkbox"/> Auger Solid Stem         </div> <div style="width: 50%;"> <input checked="" type="checkbox"/> Auger Hollow Stem  <input checked="" type="checkbox"/> Air Rotary  <input checked="" type="checkbox"/> Core Barrel  <input checked="" type="checkbox"/> Excavated Pit         </div> </div>	WATER LEVEL OBSERVATIONS					
		While Drilling	<input checked="" type="checkbox"/> N/A	ft	Upon Completion of Drilling	<input checked="" type="checkbox"/> N/A	ft
		Time After Drilling	N/A		N/A	N/A	N/A
		Depth To Water (ft)	N/A		N/A	N/A	N/A
Remarks: N/A							

150133 SHIPROCK AIRPORT RUNWAY GPJ 2-7-17 ATEK BORING (W/REMARKS-SH#-SAME FIG#)

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 142+00, 25ft right of Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-21					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/12/16			Date Finished: 12/12/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT			LL	PI					
0.2			6-4-12	11.3	117.7			88		Asphaltic Concrete (2-inches)	0.2	
0.8										Aggregate Base Course (8-inches)	0.8	
2.5			2-3-9	18.4	107.1			94	CL	Silty Clay (CL-ML), 12% medium to fine grained sand, 88% clay and silt, firm, low plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)	2.5	
			13-36-50/2"	10.9	125.1			88		Clay (CL), 6% medium to fine grained sand, 94% clay, moderately firm, low plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl		
			16-40-50/6"									
15												

Bottom of boring at 15 feet bgs.  
 Bottom of sampler at 11.5 feet bgs.  
 No groundwater encountered.

Sampler Types: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby  <input type="checkbox"/> Bulk Sample  <input type="checkbox"/> Grab Sample         </div> <div style="width: 50%;"> <input type="checkbox"/> Penetrometer  <input type="checkbox"/> Vane Shear  <input checked="" type="checkbox"/> California         </div> </div>				Operation Types: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Mud Rotary  <input type="checkbox"/> Auger Solid Stem  <input type="checkbox"/> Excavated Pit         </div> <div style="width: 50%;"> <input type="checkbox"/> Auger Hollow Stem  <input type="checkbox"/> Air Rotary  <input type="checkbox"/> Core Barrel         </div> </div>				WATER LEVEL OBSERVATIONS <table style="width:100%; border-collapse: collapse;"> <tr> <td>While Drilling</td> <td><u>▽</u></td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td><u>▽</u></td> <td>N/A</td> </tr> <tr> <td>Time After Drilling</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> </tr> <tr> <td>Depth To Water (ft)</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> </tr> <tr> <td>Remarks:</td> <td colspan="6">N/A</td> </tr> </table>				While Drilling	<u>▽</u>	N/A	ft	Upon Completion of Drilling	<u>▽</u>	N/A	Time After Drilling		N/A				N/A	Depth To Water (ft)		N/A				N/A	Remarks:	N/A					
While Drilling	<u>▽</u>	N/A	ft	Upon Completion of Drilling	<u>▽</u>	N/A																																	
Time After Drilling		N/A				N/A																																	
Depth To Water (ft)		N/A				N/A																																	
Remarks:	N/A																																						

ATEK Project Number: <div style="border: 1px solid black; padding: 5px; text-align: center;">150133</div>		<b>LOG OF EXPLORATORY BORING B-21</b>
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150133 SHIPROCK AIRPORT RUNWAY.GPJ \* 2-7-17 \* ATEK BORING (W/REMARKS-SH#-SAME FIG#)



Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 146+00, 27ft left of Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-23		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/12/16	Date Finished: 12/12/16

Elevation and Datum: Ground:										Notes:		
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
			SPT									
2			6-7-30					42 SC-SM		Asphaltic Concrete (2-inches)	0.2	
4			6-9-29					90 CL		Silty Clayey Sand (SC-SM) with gravel, 27% fine graded gravel, 35% coarse to fine grained sand, 42% silt and clay, dense, low plasticity, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 3-inches)	0.4	
6			30-50/2"					82		Clay (CL) with Mudstone and Shale, 1% fine graded gravel, 9% coarse to fine grained sand, 90% clay, very firm to hard, low to medium plasticity, dark purple to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
8												
10			4-27-39									
12												
14												
15												

Bottom of boring at 15 feet bgs.  
 Bottom of sampler at 11.5 feet bgs.  
 No groundwater encountered.

Sampler Types:	<input checked="" type="checkbox"/> Split Spoon	<input checked="" type="checkbox"/> Penetrometer	Operation Types:	<input type="checkbox"/> Auger Hollow Stem	WATER LEVEL OBSERVATIONS				
	<input checked="" type="checkbox"/> Shelby	<input type="checkbox"/> Vane Shear		<input type="checkbox"/> Mud Rotary	<input type="checkbox"/> Air Rotary	While Drilling	<u>∇</u> N/A ft	Upon Completion of Drilling	<u>∇</u> N/A
	<input type="checkbox"/> Bulk Sample	<input checked="" type="checkbox"/> California		<input type="checkbox"/> Auger Solid Stem	<input type="checkbox"/> Core Barrel	Time After Drilling	<u>      </u> N/A	<u>      </u> N/A	<u>      </u> N/A
	<input type="checkbox"/> Grab Sample			<input type="checkbox"/> Excavated Pit	Depth To Water (ft)	<u>      </u> N/A	<u>      </u> N/A	<u>      </u> N/A	<u>      </u> N/A
					Remarks: N/A				

150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (WI)REMARKS-SH#-SAME FIG#

Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 148+00, 25ft right of Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-24		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/12/16	Date Finished: 12/12/16

Elevation and Datum: Ground:										Notes:	
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	-200 (%)	USCS CLASSIFICATION	GRAPHIC LOG	
			SPT			LL	PI				
			5-8-16	5.8		29	12	85	SM	Asphaltic Concrete (2-inches)	0.2
2									CL-ML	Silty Sand (SM) with gravel, 19% fine graded gravel, 52% coarse to fine grained sand, 29% silt, medium dense, non plastic, dark brown, moist, no cementation, no reaction to HCl (Aggregate Base Course, 6-inches)	0.7
			5-10-16							Silty Clay (CL-ML), 11% medium to fine grained sand, 89% silt and clay, firm to hard, low plasticity, dark brown, moist, no cementation, no reaction to HCl (Native Material)	
4			18-50/5"								4.9

Bottom of boring at 4 feet bgs.  
Bottom of sampler at 4.9 feet bgs.  
No groundwater encountered.

<b>Sampler Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby  <input type="checkbox"/> Bulk Sample  <input type="checkbox"/> Grab Sample </div> <div style="width: 50%;"> <input type="checkbox"/> Penetrometer  <input type="checkbox"/> Vane Shear  <input type="checkbox"/> California </div> </div>	<b>Operation Types:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Mud Rotary  <input type="checkbox"/> Auger Solid Stem </div> <div style="width: 50%;"> <input type="checkbox"/> Auger Hollow Stem  <input type="checkbox"/> Air Rotary  <input type="checkbox"/> Core Barrel  <input type="checkbox"/> Excavated Pit </div> </div>	<b>WATER LEVEL OBSERVATIONS</b>			
		While Drilling <input checked="" type="checkbox"/> N/A ft    Upon Completion of Drilling <input checked="" type="checkbox"/> N/A ft			
		Time After Drilling <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A			
		Depth To Water (ft) <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A			
Remarks: N/A					

Project Name: Shiprock Airstrip					Client: Armstrong Consultants				
Borehole Location: Sta. 150+00 on Center Line								Sheet <u>1</u> of <u>1</u>	
Borehole Number: B-25					Driller: GeoMat			Logger: J Floyd	
Drilling Equipment: CME - 55			Borehole Diameter (in.): 6 5/8 HSA		Date Started: 12/12/16			Date Finished: 12/12/16	
Elevation and Datum: Ground:					Notes:				

DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST SPT	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT		PLASTICITY INDEX	USCS CLASSIFICATION	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
						LL	PI						
			4-6-11								Asphaltic Concrete (3-inches)	0.3	
											Aggregate Base Course (8-inches)	0.9	
2									SC		Clayey Sand (SC), 5% coarse to fine graded gravel, 50% coarse to fine grained sand, 45% clay, very firm, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
4			4-7-19										
6			17-50/5"										
8													
10			13-30-39										
12													
14													
15													

Bottom of boring at 15 feet bgs.  
 Bottom of sampler at 11.5 feet bgs.  
 No groundwater encountered.

<b>Sampler Types:</b> <input checked="" type="checkbox"/> Split Spoon <input checked="" type="checkbox"/> Penetrometer <input checked="" type="checkbox"/> Shelby <input checked="" type="checkbox"/> Vane Shear <input checked="" type="checkbox"/> Bulk Sample <input checked="" type="checkbox"/> California <input checked="" type="checkbox"/> Grab Sample				<b>Operation Types:</b> <input checked="" type="checkbox"/> Auger Hollow Stem <input checked="" type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Air Rotary <input checked="" type="checkbox"/> Auger Solid Stem <input checked="" type="checkbox"/> Core Barrel <input checked="" type="checkbox"/> Excavated Pit				<b>WATER LEVEL OBSERVATIONS</b> <table style="width:100%; border-collapse: collapse;"> <tr> <td>While Drilling</td> <td><u>  </u></td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td><u>  </u></td> <td>N/A</td> </tr> <tr> <td>Time After Drilling</td> <td><u>  </u></td> <td>N/A</td> <td></td> <td><u>  </u></td> <td>N/A</td> <td></td> </tr> <tr> <td>Depth To Water (ft)</td> <td><u>  </u></td> <td>N/A</td> <td></td> <td><u>  </u></td> <td>N/A</td> <td></td> </tr> <tr> <td>Remarks:</td> <td colspan="6">N/A</td> </tr> </table>				While Drilling	<u>  </u>	N/A	ft	Upon Completion of Drilling	<u>  </u>	N/A	Time After Drilling	<u>  </u>	N/A		<u>  </u>	N/A		Depth To Water (ft)	<u>  </u>	N/A		<u>  </u>	N/A		Remarks:	N/A					
While Drilling	<u>  </u>	N/A	ft	Upon Completion of Drilling	<u>  </u>	N/A																																	
Time After Drilling	<u>  </u>	N/A		<u>  </u>	N/A																																		
Depth To Water (ft)	<u>  </u>	N/A		<u>  </u>	N/A																																		
Remarks:	N/A																																						

ATEK Project Number:		LOG OF EXPLORATORY BORING B-25	
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150133 SHIPROCK AIRPORT RUNWAY.GPJ · 2-7-17 · ATEK BORING (WIREFORMS-SH#-SAME FIG#)

Project Name: Shiprock Airstrip		Client: Armstrong Consultants	
Borehole Location: Sta. 99+00 on Center Line			Sheet <u>1</u> of <u>1</u>
Borehole Number: B-26		Driller: GeoMat	Logger: J Floyd
Drilling Equipment: CME - 55	Borehole Diameter (in.): 6 5/8 HSA	Date Started: 12/13/16	Date Finished: 12/13/16

Elevation and Datum: Ground:										Notes:				
DEPTH (ft)	DRILL OPERATION	SAMPLE	STANDARD PENETRATION TEST	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	LIQUID LIMIT	PLASTICITY INDEX	-200 (%)	USCS CLASSIFICATION			GRAPHIC LOG		
			SPT			LL	PI					MATERIAL DESCRIPTION	DEPTH (ft)	REMARKS
2			17-27-50/6"						SC			Clayey Sand (SC), 5% coarse to fine graded gravel, 50% coarse to fine grained sand, 45% clay, very firm, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCl (Native Material)		
			25-50/5"											
4			50/6"										4.5	

Bottom of boring at 4 feet bgs.  
 Bottom of sampler at 4.5 feet bgs.  
 No groundwater encountered.

Sampler Types: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Split Spoon  <input type="checkbox"/> Shelby  <input type="checkbox"/> Bulk Sample  <input type="checkbox"/> Grab Sample         </div> <div style="width: 50%;"> <input type="checkbox"/> Penetrometer  <input type="checkbox"/> Vane Shear  <input checked="" type="checkbox"/> California         </div> </div>		Operation Types: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Mud Rotary  <input type="checkbox"/> Auger Solid Stem         </div> <div style="width: 50%;"> <input type="checkbox"/> Auger Hollow Stem  <input type="checkbox"/> Air Rotary  <input type="checkbox"/> Core Barrel  <input type="checkbox"/> Excavated Pit         </div> </div>		WATER LEVEL OBSERVATIONS <table style="width:100%; border-collapse: collapse;"> <tr> <td>While Drilling</td> <td><math>\nabla</math></td> <td>N/A</td> <td>ft</td> <td>Upon Completion of Drilling</td> <td><math>\nabla</math></td> <td>N/A</td> <td>ft</td> </tr> <tr> <td>Time After Drilling</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td>Depth To Water (ft)</td> <td></td> <td>N/A</td> <td></td> <td></td> <td></td> <td>N/A</td> <td></td> </tr> <tr> <td colspan="8">Remarks: N/A</td> </tr> </table>				While Drilling	$\nabla$	N/A	ft	Upon Completion of Drilling	$\nabla$	N/A	ft	Time After Drilling		N/A				N/A		Depth To Water (ft)		N/A				N/A		Remarks: N/A							
While Drilling	$\nabla$	N/A	ft	Upon Completion of Drilling	$\nabla$	N/A	ft																																
Time After Drilling		N/A				N/A																																	
Depth To Water (ft)		N/A				N/A																																	
Remarks: N/A																																							

ATEK Project Number: <div style="border: 1px solid black; padding: 2px; display: inline-block;">150133</div>		LOG OF EXPLORATORY BORING B-26	
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Project Name: Shiprock Airstrip								Client: Armstrong Consultants																			
Borehole Location: Sta. 121+00, 190ft left of Center Line									Sheet 1 of 1																		
Borehole Number: B-27							Driller: GeoMat				Logger: J Floyd																
Drilling Equipment: CME - 55				Borehole Diameter (in.): 6 5/8 HSA				Date Started: 12/13/16				Date Finished: 12/13/16															
Elevation and Datum:							Notes:																				
DEPTH (ft)													MATERIAL DESCRIPTION													DEPTH (ft)	REMARKS
DRILL OPERATION																											
SAMPLE																											
STANDARD PENETRATION TEST																											
SPT																											
MOISTURE CONTENT (%)																											
DRY DENSITY (pcf)																											
LIQUID LIMIT																											
PLASTICITY INDEX																											
-200 (%)																											
USCS CLASSIFICATION																											
GRAPHIC LOG																											
Asphaltic Concrete (2-inches)																										0.2	
Aggregate Base Course (5-inches)																										0.6	
Clayey Sand (SC), 5% coarse to fine graded gravel, 50% coarse to fine grained sand, 45% clay, very firm, medium plasticity, dark to reddish brown, moist, no cementation, no reaction to HCI (Native Material)																											
5-6-7																											
3-4-9																											
4-10-13																											
15-27-50/4"																											
Bottom of boring at 15 feet bgs. Bottom of sampler at 11.4 feet bgs. No groundwater encountered.																											
Sampler Types:													WATER LEVEL OBSERVATIONS														
Split Spoon													While Drilling N/A ft Upon Completion of Drilling N/A														
Shelby													Time After Drilling N/A N/A N/A														
Bulk Sample													Depth To Water (ft) N/A N/A N/A														
Grab Sample													Remarks: N/A														
Penetrometer																											
Vane Shear																											
California																											
Operation Types:																											
Mud Rotary																											
Auger Solid Stem																											
Auger Hollow Stem																											
Air Rotary																											
Core Barrel																											
Excavated Pit																											
ATEK Project Number: 150133													LOG OF EXPLORATORY BORING B-27														



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/13/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL					SAND					Silt or Clay																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
					6"	4"	3"	2"	Coarse			Fine		Coarse	Medium			Fine		#200	#100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
									1 1/2"	1 1/4"	1"	3/4"	1/2"		3/8"	1/4"	#4	#8	#10			#16	#30	#40	#50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												

PERCENT PASSING BY WEIGHT

Bulk Sample, B-1 @ 0'-5'	CL	29	19	10	100	100	100	100	100	100	100	100	100	100	100	99	99	98	96	95	94	91	84	1
Ring Sample, B-1 @ 0.2'-1.7'					100	100	100	100	100	100	95	90	85	75	69	57	55	50	43	37	29	16	9.6	2
Ring Sample, B-1 @ 2.5'-4'					100	100	100	100	100	100	100	100	100	100	100	100	100	99	99	99	98	98	95	3
Ring Sample, B-1 @ 4'-5.5'					100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	98	96	93	93	4
Ring Sample, B-2 @ 0.2'-1.7'					100	100	100	100	100	96	94	89	80	69	63	53	51	46	39	34	28	17	11	6
Ring Sample, B-2 @ 2.5'-4'					100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	96	7
Ring Sample, B-2 @ 4'-5.5'					100	100	100	100	100	100	100	100	100	100	100	100	100	99	99	99	99	98	95	8
Ring Sample, B-3 @ 0.2'-1.7'					100	100	100	100	100	100	95	90	86	78	72	60	58	52	43	36	29	16	9.8	9
Ring Sample, B-3 @ 2.5'-4'					100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	97	96	95	93	10
Ring Sample, B-3 @ 4'-5.5'					100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	97	96	96	95	11

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/13/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL					SAND					Silt or Clay		Lab #					
					6"	4"	3"	2"	Coarse			Fine		Coarse	Medium			Fine		Clay							
									1 1/2"	1 1/4"	1"	3/4"	1/2"		3/8"	1/4"	#4	#8	#10		#16		#30	#40	#50	#100	#200

PERCENT PASSING BY WEIGHT

Ring Sample, B-4 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	13
Ring Sample, B-4 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	14
Ring Sample, B-4 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	15
Ring Sample, B-5 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	87	80	71	67	58	56	52	46	41	35	23	16	16
Ring Sample, B-5 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	97	95	93	89	17
Ring Sample, B-5 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	96	95	93	87	18
Ring Sample, B-6 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	98	89	85	74	67	55	53	47	40	33	25	11	4.1	20
Ring Sample, B-6 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	99	98	97	21
Ring Sample, B-6 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	99	97	95	22
Bulk Sample, B-7 @ 0'-5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	96	94	92	91	89	87	82	23

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, NM  
**DATE SAMPLED:** 12/13/2016

## MECHANICAL SIEVE ANALYSIS

## SIEVE SIZES

[illegible]

## PERCENT PASSING BY WEIGHT

Ring Sample, B-7 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	10
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This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.

p 480.659.8065  
f 480.656.9658



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/13/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

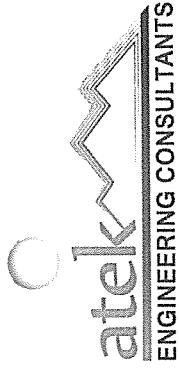
SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES										GRAVEL										SAND										Silt or Clay		Lab #																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
					6"	4"	3"	2"	1 1/2"	1 1/4"	1"	3/4"	1/2"	3/8"	1/4"	Coarse			Fine			Coarse			Medium			Fine				#100	#200																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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PERCENT PASSING BY WEIGHT

	Ring Sample, B-10 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	94	36	
	Ring Sample, B-10 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	94	37	
	Ring Sample, B-11 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	38	
	Ring Sample, B-11 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	39	
	Ring Sample, B-11 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	88	40	
	Ring Sample, B-12 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	13	42
	Ring Sample, B-12 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	94	43	
	Ring Sample, B-12 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	96	44	
	Bulk Sample, B-13 @ 0'-5'	CL	30	18	12	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	88	45
	Ring Sample, B-13 @ 0.2'-1.7'					100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	14	46

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/13/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL					SAND					Silt or Clay	
					3"	2"	Coarse			Fine		Coarse	Medium		Fine			#100	#200		
							1 1/2"	1 1/4"	1"	3/4"	1/2"		3/8"	1/4"	#4	#8	#10			#16	#30
Lab #																					

PERCENT PASSING BY WEIGHT

Ring Sample, B-13 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	61	47
Ring Sample, B-13 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	94	48
Ring Sample, B-14 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	73	50
Ring Sample, B-14 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	51
Ring Sample, B-14 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	95	52
Ring Sample, B-15 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90	53
Ring Sample, B-15 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	54
Ring Sample, B-15 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	55
Ring Sample, B-16 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	12	57
Ring Sample, B-16 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	94	58

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/12/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

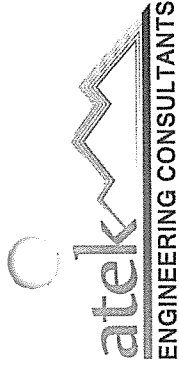
SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL					SAND										Silt or Clay		Lab #																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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PERCENT PASSING BY WEIGHT

Ring Sample, B-16 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	100	98	59
Ring Sample, B-17 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	60
Ring Sample, B-17 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	61
Ring Sample, B-17 @ 4'-5.2'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	62
Ring Sample, B-18 @ 0.3'-1.8'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	64
Ring Sample, B-18 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	65
Ring Sample, B-18 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	66
Bulk Sample, B-19 @ 0'-5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	67
Ring Sample, B-19 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	68
Ring Sample, B-19 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	69

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/12/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

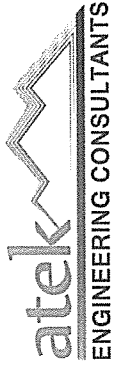
SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL					SAND					Silt or Clay									
					3"	2"	1 1/2"	1 1/4"	1"	Coarse					Fine					Coarse					Fine				
										3/4"	1/2"	3/8"	1/4"	#4	#8	#10	#16	#30	#40	#50	#100	#200	Lab #						

PERCENT PASSING BY WEIGHT

Ring Sample, B-19 @ 4'-4.9'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	97	96	70
Ring Sample, B-20 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	96	94	87	82	69	67	61	53	46	37	22	14	72
Ring Sample, B-20 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	98	97	96	73
Ring Sample, B-20 @ 4'-5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	98	97	96	95	74
Ring Sample, B-21 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	97	96	95	92	88	75
Ring Sample, B-21 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	96	96	95	94	94	76
Ring Sample, B-21 @ 4'-5.2'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	98	96	95	94	94	93	88	77
Ring Sample, B-22 @ 0.2'-1.7'	100	100	100	100	100	100	86	86	83	77	72	65	61	52	50	45	39	34	29	18	13	79		
Ring Sample, B-22 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	97	97	96	94	80	
Ring Sample, B-22 @ 4'-5.3'	100	100	100	100	100	100	100	100	100	100	99	97	95	93	91	90	87	85	84	84	83	76	81	

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/12/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL				SAND										Silt or Clay		Lab #					
					6"	4"	3"	2"	1 1/2"	1 1/4"	1"	3/4"	1/2"	3/8"	1/4"	Coarse			Fine			Coarse			Medium			Fine			
																#4	#8	#10	#16	#30	#40	#50	#100	#200							

PERCENT PASSING BY WEIGHT

Ring Sample, B-23 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	73	67	66	63	57	54	51	46	42	82
Ring Sample, B-23 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	99	98	96	94	93	93	92	90	83
Ring Sample, B-23 @ 4'-4.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	98	98	93	89	88	87	86	82	84
Bulk Sample, B-24 @ 0'-5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	97	95	94	93	90	85	86
Ring Sample, B-24 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	97	94	92	86	81	71	69	64	58	53	47	36	29	87
Ring Sample, B-24 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	96	95	94	92	89	88
Ring Sample, B-24 @ 4'-4.9'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	97	96	95	93	92	92	90	84	89
Ring Sample, B-25 @ 0.3'-1.8'	100	100	100	100	100	100	100	100	100	100	100	100	98	83	78	68	62	54	52	46	37	31	26	18	12	90
Ring Sample, B-25 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	98	97	96	95	91	91
Ring Sample, B-25 @ 4'-4.9'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	98	97	95	91	92	92

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.



PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, NM  
DATE SAMPLED: 12/12/2016

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
REVIEWED BY: J Floyd

MECHANICAL SIEVE ANALYSIS  
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

Location & Depth	USCS	LL	PL	PI	COBBLES					GRAVEL					SAND										Silt or Clay		Lab #	
					6"	4"	3"	2"	1 1/2"	1 1/4"	1"	Coarse		Fine	1/4"	3/8"	1/2"	3/4"	1"	Coarse	Medium			Fine				
																					#4	#8	#10	#16	#30	#40		#50

PERCENT PASSING BY WEIGHT

Ring Sample, B-26 @ 0'-1.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	99	96	94
Ring Sample, B-26 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	92	90	95
Ring Sample, B-26 @ 4'-4.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	96	95	96
Ring Sample, B-27 @ 0.2'-1.7'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	94	93	91	88	86	82	76	71	71	97	
Ring Sample, B-27 @ 2.5'-4'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	93	89	98
Ring Sample, B-27 @ 4'-5.5'	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	96	95	99

This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at client's request.

**PROJECT NAME:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**SAMPLE DATE:** 12/12/2016  
**SAMPLE SOURCE:** Bulk Sample B-1 @ 0'-5'

**PROJECT:** 150133  
**WORK ORDER:** 1610672  
**REVIEWED BY:** J Floyd

**PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D422)**

WEIGHT OF SAMPLE DISPERSED 74.63  
PERCENT PASSING #10 SIEVE 98.89  
SPECIFIC GRAVITY OF SOLIDS 2.64

**HYDROMETER RESULTS (% PASSING)**

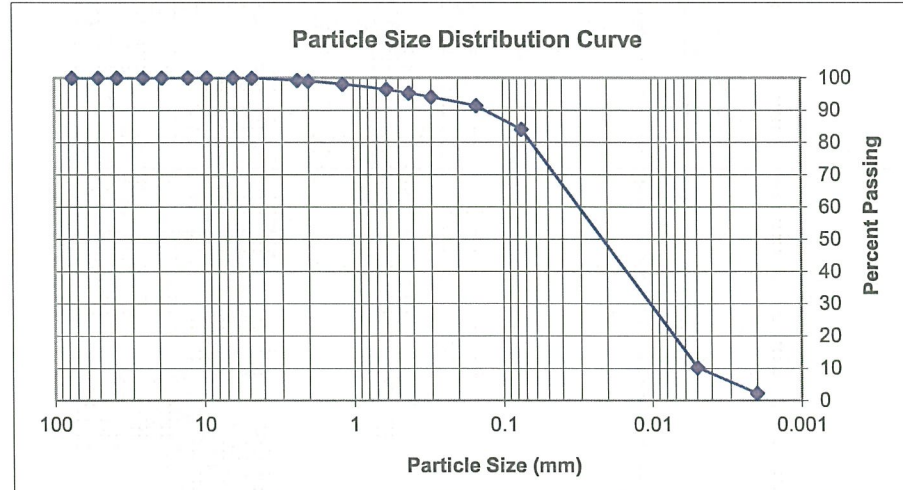
PARTICLE SIZE (DIA. mm)	0.0714	0.0505	0.0343	0.0201	0.0144	0.0102	0.0022	0.0023
PERCENT SAMPLE TESTED	40.1	40.1	26.7	24.0	21.3	20.0	5.2	2.5
PERCENT TOTAL SAMPLE	39.6	39.6	26.4	23.7	21.1	19.7	5.2	2.5

**FULL SIEVE ANALYSIS  
MECHANICAL SIEVE & HYDROMETER  
(% PASSING)**

3 IN	100
2 IN	100
1 1/2 IN	100
1 IN	100
3/4 IN	100
1/2 IN	100
3/8 IN	100
1/4 IN	100
# 4	100
# 8	99
# 10	99
# 16	98
# 30	96
# 40	95
# 50	94
# 100	91
# 200	84
0.005 mm	10
0.002 mm	2

**MECHANICAL SIEVE ANALYSIS AFTER HYDROMETER (% PASSING)**

#200	#100	#50	#40	#30	#16	#10
86	93	95	96	97	98	99



**PROJECT NAME:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**SAMPLE DATE:** 12/12/2016  
**SAMPLE SOURCE:** Bulk Sample B-7 @ 0'-5'

**PROJECT:** 150133  
**WORK ORDER:** 1610672  
**REVIEWED BY:** J Floyd

**PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D422)**

WEIGHT OF SAMPLE DISPERSED 74.60  
PERCENT PASSING #10 SIEVE 96.01  
SPECIFIC GRAVITY OF SOLIDS 2.64

**HYDROMETER RESULTS (% PASSING)**

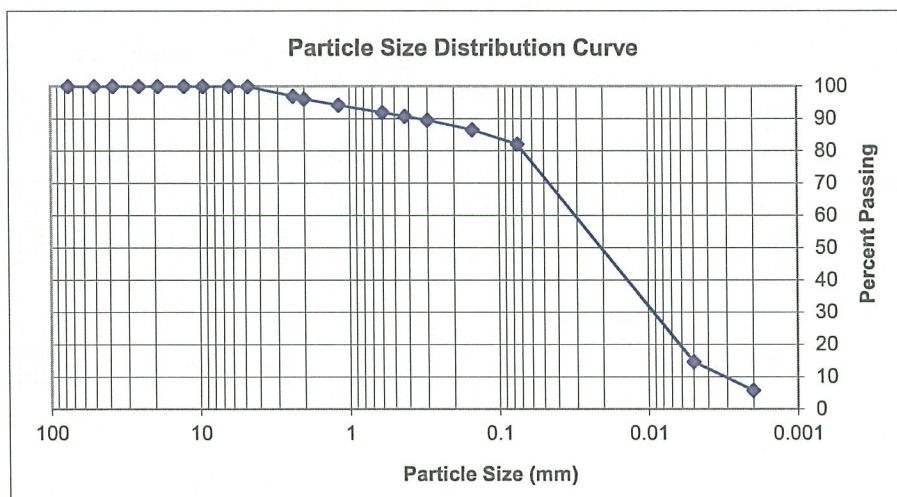
PARTICLE SIZE (DIA. mm)	0.0625	0.0442	0.0294	0.0190	0.0136	0.0098	0.0022	0.0016
PERCENT SAMPLE TESTED	60.2	60.2	38.7	34.7	32.0	28.0	7.9	2.5
PERCENT TOTAL SAMPLE	57.8	57.8	37.2	33.3	30.8	26.9	7.6	2.4

**FULL SIEVE ANALYSIS  
MECHANICAL SIEVE & HYDROMETER  
(% PASSING)**

3 IN	100
2 IN	100
1 1/2 IN	100
1 IN	100
3/4 IN	100
1/2 IN	100
3/8 IN	100
1/4 IN	100
# 4	100
# 8	97
# 10	96
# 16	94
# 30	92
# 40	91
# 50	89
# 100	87
# 200	82
0.005 mm	15
0.002 mm	6

**MECHANICAL SIEVE ANALYSIS AFTER HYDROMETER (% PASSING)**

#200	#100	#50	#40	#30	#16	#10
89	92	93	94	94	95	96



**PROJECT NAME:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**SAMPLE DATE:** 12/12/2016  
**SAMPLE SOURCE:** Bulk Sample B-13 @ 0'-5'

**PROJECT:** 150133  
**WORK ORDER:** 1610672  
**REVIEWED BY:** J Floyd

**PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D422)**

WEIGHT OF SAMPLE DISPERSED 62.04  
PERCENT PASSING #10 SIEVE 98.97  
SPECIFIC GRAVITY OF SOLIDS 2.64

**HYDROMETER RESULTS (% PASSING)**

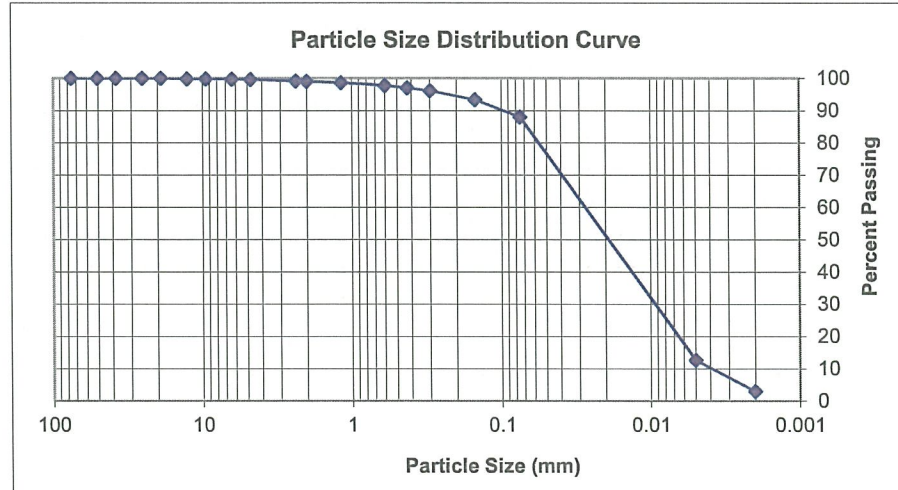
PARTICLE SIZE (DIA. mm)	0.0674	0.0476	0.0332	0.0196	0.0139	0.0100	0.0023	0.0016
PERCENT SAMPLE TESTED	59.5	59.5	40.1	35.3	33.7	30.5	3.1	3.1
PERCENT TOTAL SAMPLE	58.9	58.9	39.7	34.9	33.3	30.1	3.0	3.0

**FULL SIEVE ANALYSIS  
MECHANICAL SIEVE & HYDROMETER  
(% PASSING)**

3 IN	100
2 IN	100
1 1/2 IN	100
1 IN	100
3/4 IN	100
1/2 IN	100
3/8 IN	100
1/4 IN	100
# 4	100
# 8	99
# 10	99
# 16	99
# 30	98
# 40	97
# 50	96
# 100	93
# 200	88
0.005 mm	13
0.002 mm	3

**MECHANICAL SIEVE ANALYSIS AFTER HYDROMETER (% PASSING)**

#200	#100	#50	#40	#30	#16	#10
94	96	98	98	99	99	99



**PROJECT NAME:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**SAMPLE DATE:** 12/12/2016  
**SAMPLE SOURCE:** Bulk Sample B-19 @ 0'-5'

**PROJECT:** 150133  
**WORK ORDER:** 1610672  
**REVIEWED BY:** J Floyd

**PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D422)**

WEIGHT OF SAMPLE DISPERSED 49.35  
PERCENT PASSING #10 SIEVE 97.62  
SPECIFIC GRAVITY OF SOLIDS 2.64

**HYDROMETER RESULTS (% PASSING)**

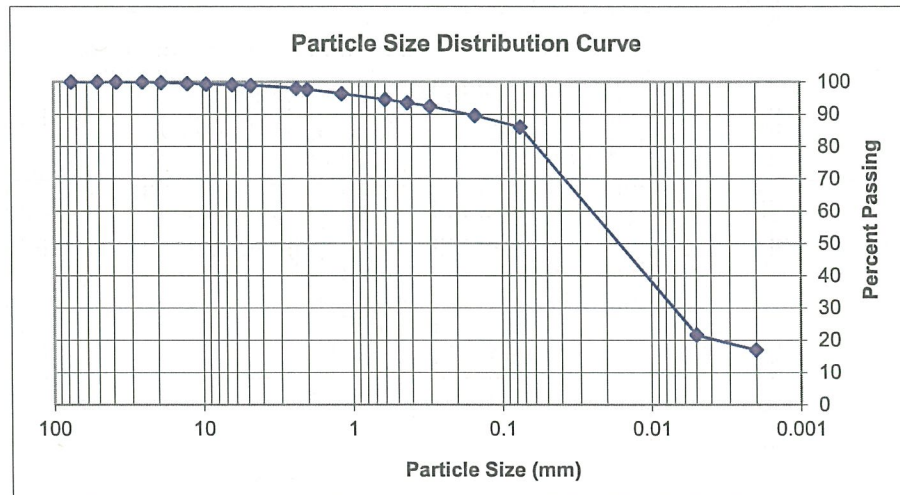
PARTICLE SIZE (DIA. mm)	0.0720	0.0509	0.0344	0.0196	0.0144	0.0103	0.0022	0.0015
PERCENT SAMPLE TESTED	58.5	58.5	40.3	34.2	32.2	30.1	18.0	15.9
PERCENT TOTAL SAMPLE	57.1	57.1	39.3	33.4	31.4	29.4	17.5	15.6

**FULL SIEVE ANALYSIS  
MECHANICAL SIEVE & HYDROMETER  
(% PASSING)**

3 IN	100
2 IN	100
1 1/2 IN	100
1 IN	100
3/4 IN	100
1/2 IN	99
3/8 IN	99
1/4 IN	99
# 4	99
# 8	98
# 10	98
# 16	96
# 30	95
# 40	94
# 50	92
# 100	90
# 200	86
0.005 mm	22
0.002 mm	17

**MECHANICAL SIEVE ANALYSIS AFTER HYDROMETER (% PASSING)**

#200	#100	#50	#40	#30	#16	#10
88	91	93	94	95	96	98



PROJECT NAME: Shiprock Airstrip  
LOCATION: Shiprock, New Mexico  
SAMPLE DATE: 12/12/2016  
SAMPLE SOURCE: Bulk Sample B-24 @ 0'-5'

PROJECT: 150133  
WORK ORDER: 1610672  
REVIEWED BY: J Floyd

**PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D422)**

WEIGHT OF SAMPLE DISPERSED 54.86  
PERCENT PASSING #10 SIEVE 98.09  
SPECIFIC GRAVITY OF SOLIDS 2.64

**HYDROMETER RESULTS (% PASSING)**

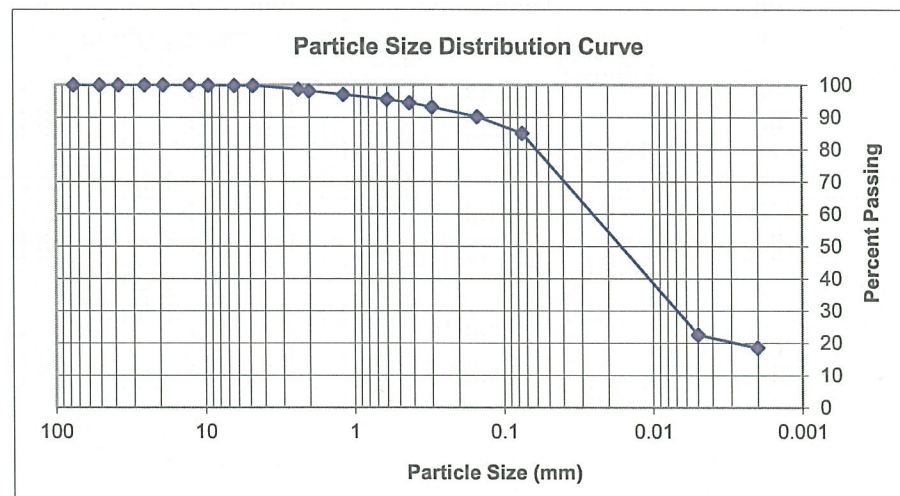
PARTICLE SIZE (DIA. mm)	0.0726	0.0513	0.0312	0.0200	0.0143	0.0102	0.0021	0.0015
PERCENT SAMPLE TESTED	50.8	50.8	38.0	34.4	30.7	28.9	19.8	16.2
PERCENT TOTAL SAMPLE	49.8	49.8	37.3	33.7	30.2	28.4	19.4	15.9

**FULL SIEVE ANALYSIS  
MECHANICAL SIEVE & HYDROMETER  
(% PASSING)**

3 IN	100
2 IN	100
1 1/2 IN	100
1 IN	100
3/4 IN	100
1/2 IN	100
3/8 IN	100
1/4 IN	100
# 4	100
# 8	99
# 10	98
# 16	97
# 30	95
# 40	94
# 50	93
# 100	90
# 200	85
0.005 mm	23
0.002 mm	19

**MECHANICAL SIEVE ANALYSIS AFTER HYDROMETER (% PASSING)**

#200	#100	#50	#40	#30	#16	#10
90	95	96	96	97	98	98

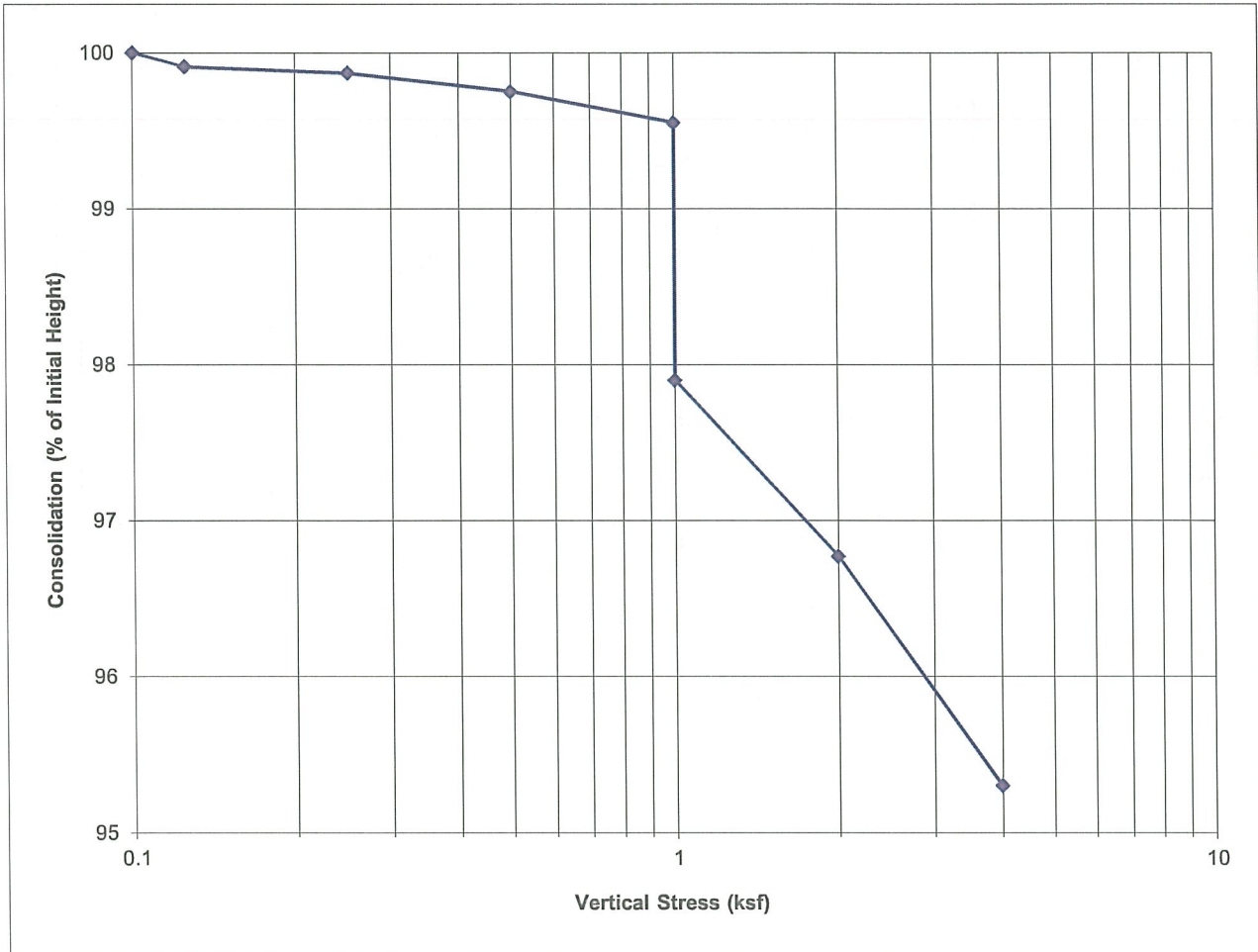


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-1 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 2  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.39
Initial Moisture Content	6.9%	Final Moisture Content	15.2%
Initial Dry Density(pcf)	112.0	Final Dry Density(pcf)	117.5
Initial Degree of Saturation	39%	Final Degree of Saturation	99%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf



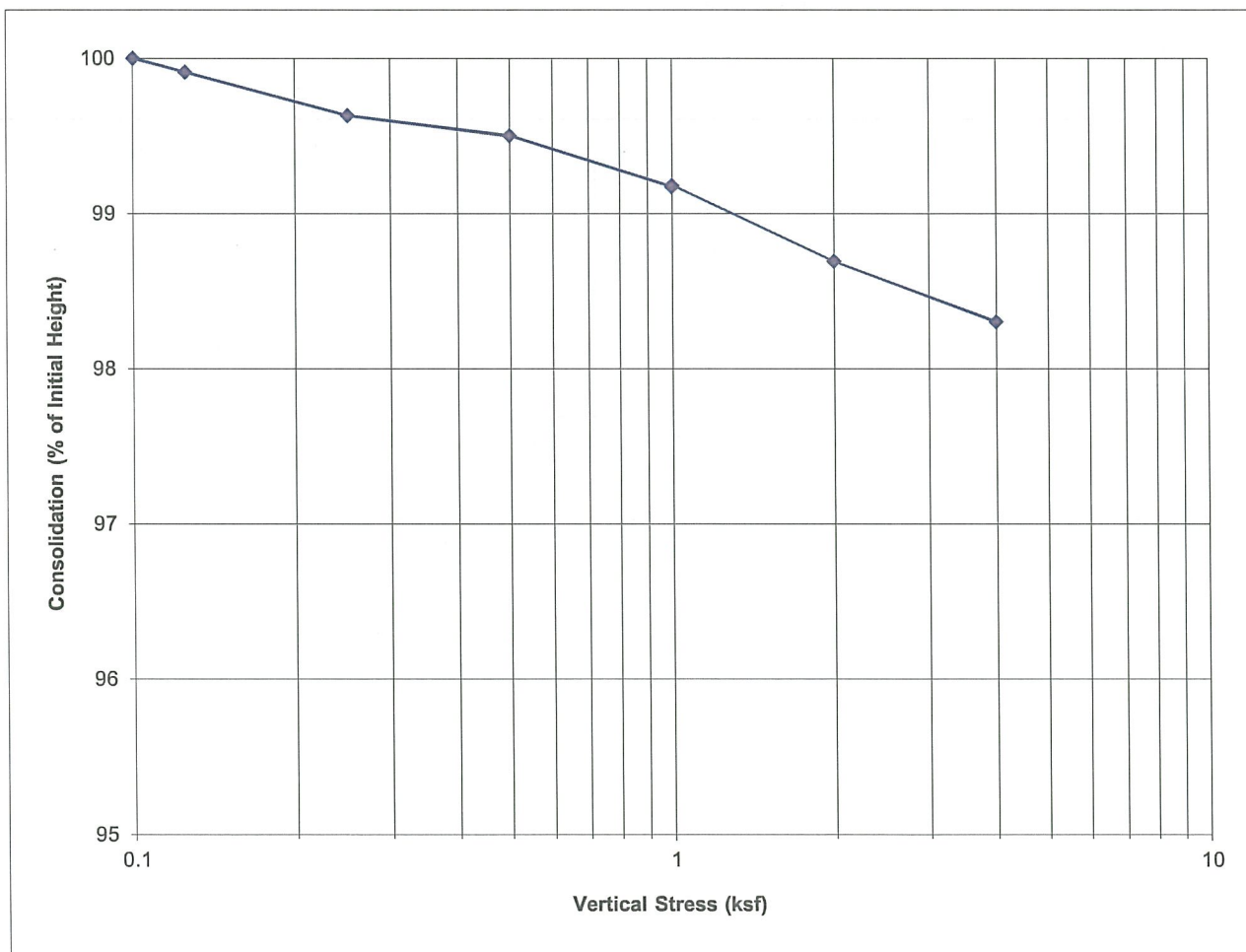


Project: Shiprock Airstrip  
Project Location: Shiprock, NM  
Client: Armstrong Consultants  
Material: Native  
Sample Source: Ring Sample B-2 @ 2.5'-4.0'  
Sample Prep: In-Situ

Project Number: 150133  
Work Order Number: 1610672  
Lab Number: 7  
Date Sampled: 12/12/16

#### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.53
Initial Moisture Content	12.5%	Final Moisture Content	13.5%
Initial Dry Density(pcf)	119.4	Final Dry Density(pcf)	121.4
Initial Degree of Saturation	86%	Final Degree of Saturation	99%
Initial Void Ratio	0.4	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf

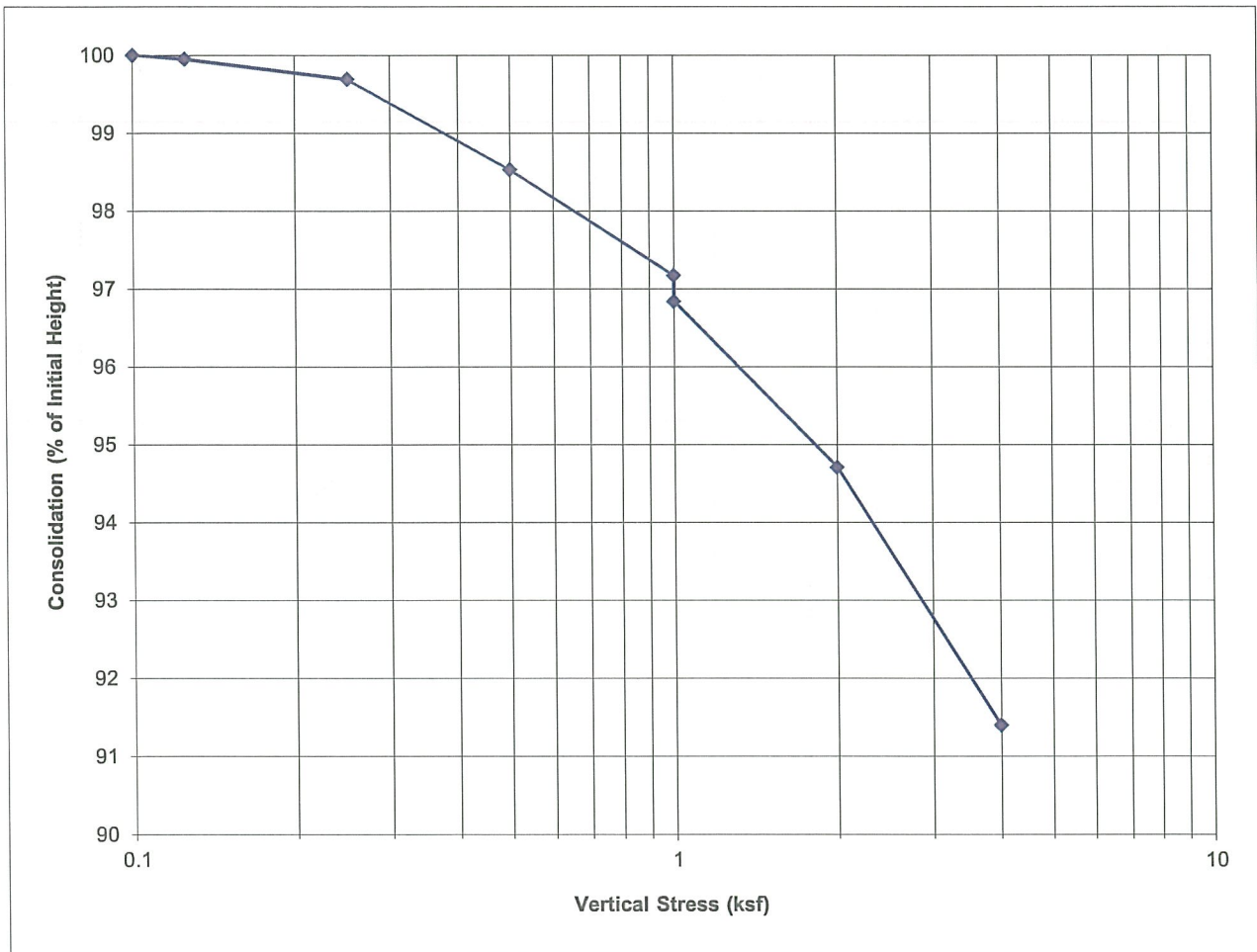


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-3 @ 4.0'-5.2'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 11  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.21
Initial Moisture Content	9.5%	Final Moisture Content	11.9%
Initial Dry Density(pcf)	114.3	Final Dry Density(pcf)	125.0
Initial Degree of Saturation	56%	Final Degree of Saturation	98%
Initial Void Ratio	0.4	Final Void Ratio	0.3
Estimated Specific Gravity	2.65	Saturated at	1 ksf



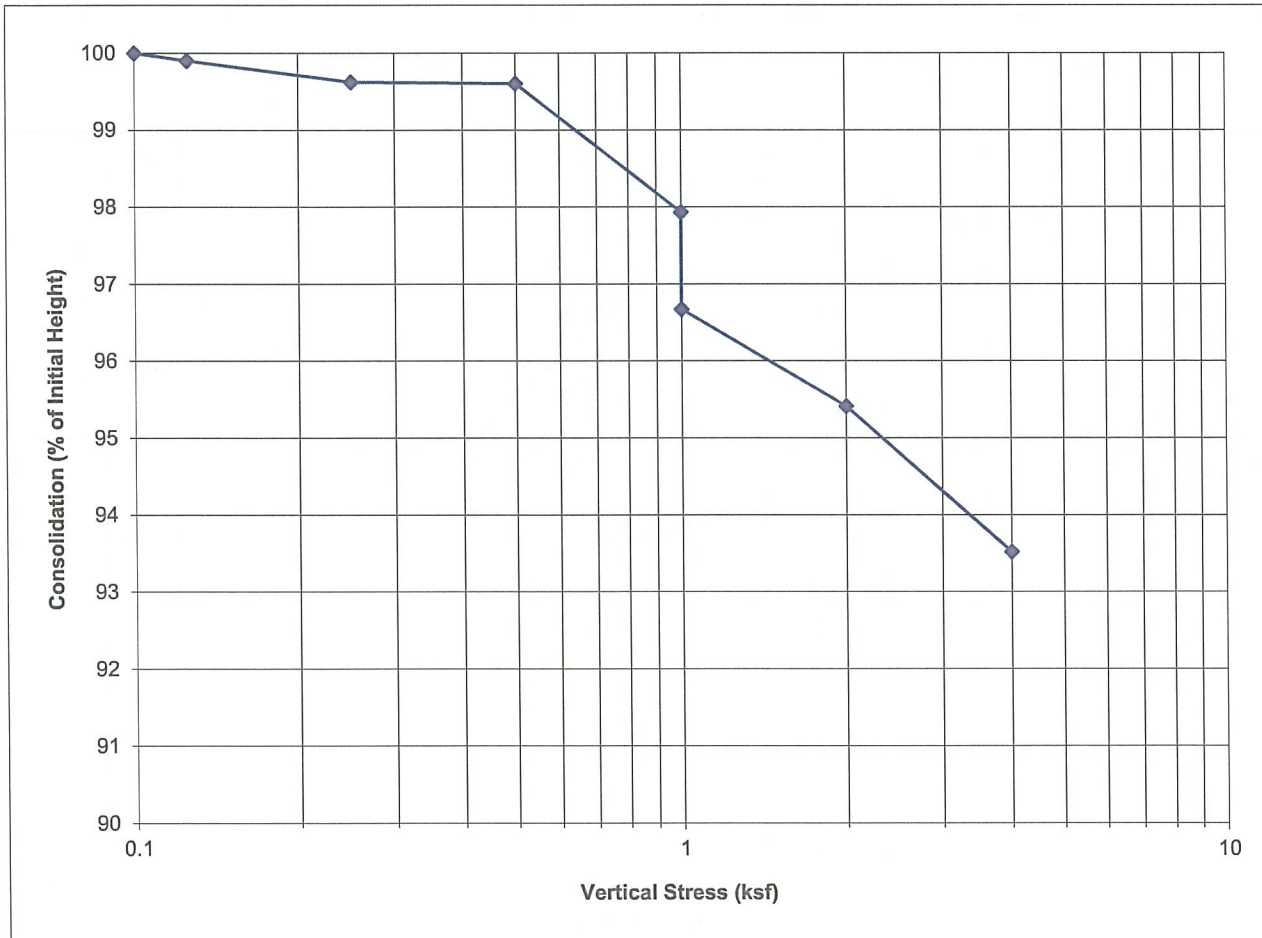


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-4 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 15  
**Date Sampled:** 12/12/16

### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.31
Initial Moisture Content	12.7%	Final Moisture Content	15.6%
Initial Dry Density(pcf)	109.1	Final Dry Density(pcf)	116.6
Initial Degree of Saturation	66%	Final Degree of Saturation	99%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf

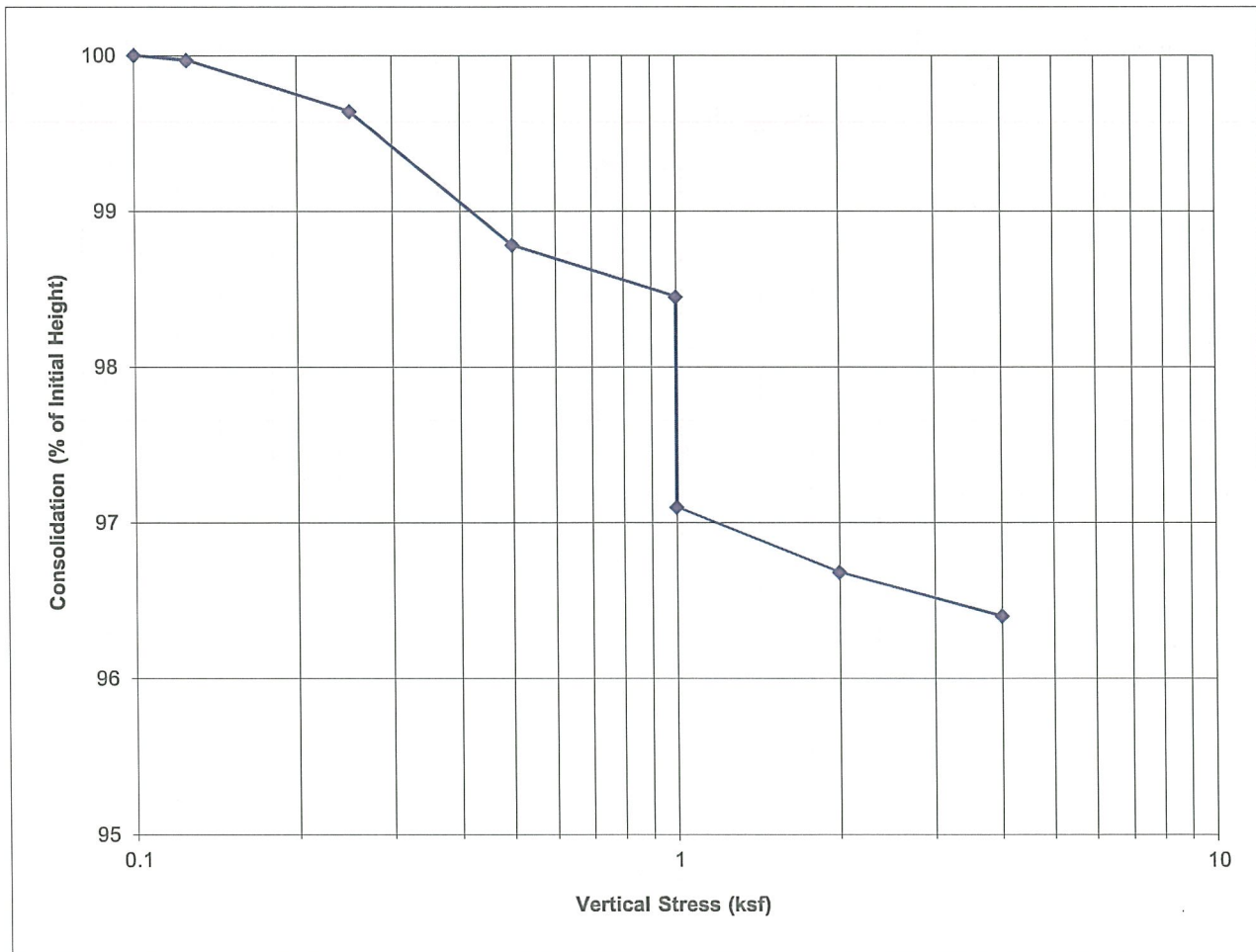


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-5 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 17  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.44
Initial Moisture Content	12.0%	Final Moisture Content	15.6%
Initial Dry Density(pcf)	112.8	Final Dry Density(pcf)	116.9
Initial Degree of Saturation	68%	Final Degree of Saturation	100%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf





**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-6 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 22  
**Date Sampled:** 12/12/16

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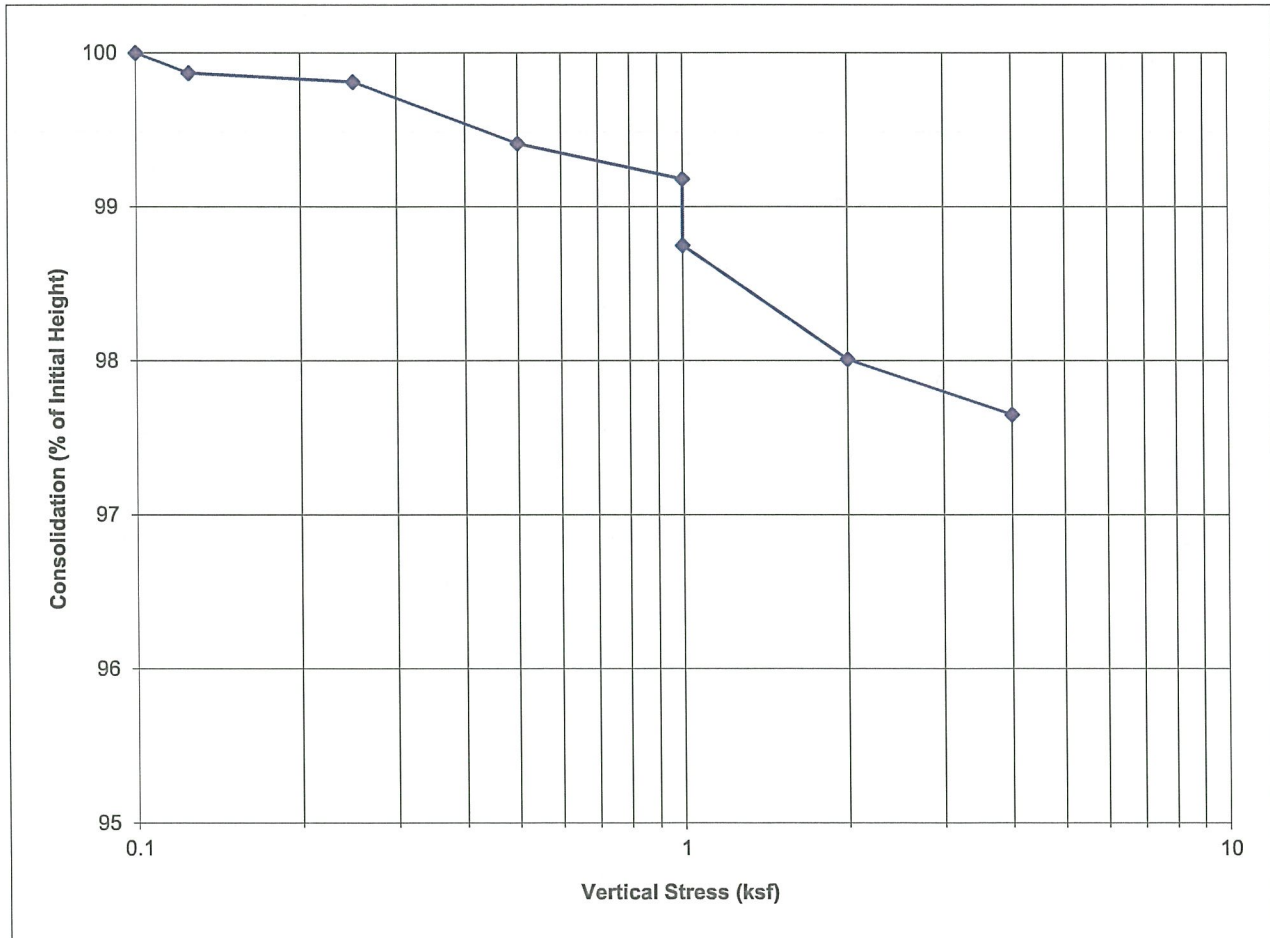
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**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

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Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.50
Initial Moisture Content	15.5%	Final Moisture Content	16.3%
Initial Dry Density(pcf)	111.8	Final Dry Density(pcf)	114.4
Initial Degree of Saturation	86%	Final Degree of Saturation	97%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf

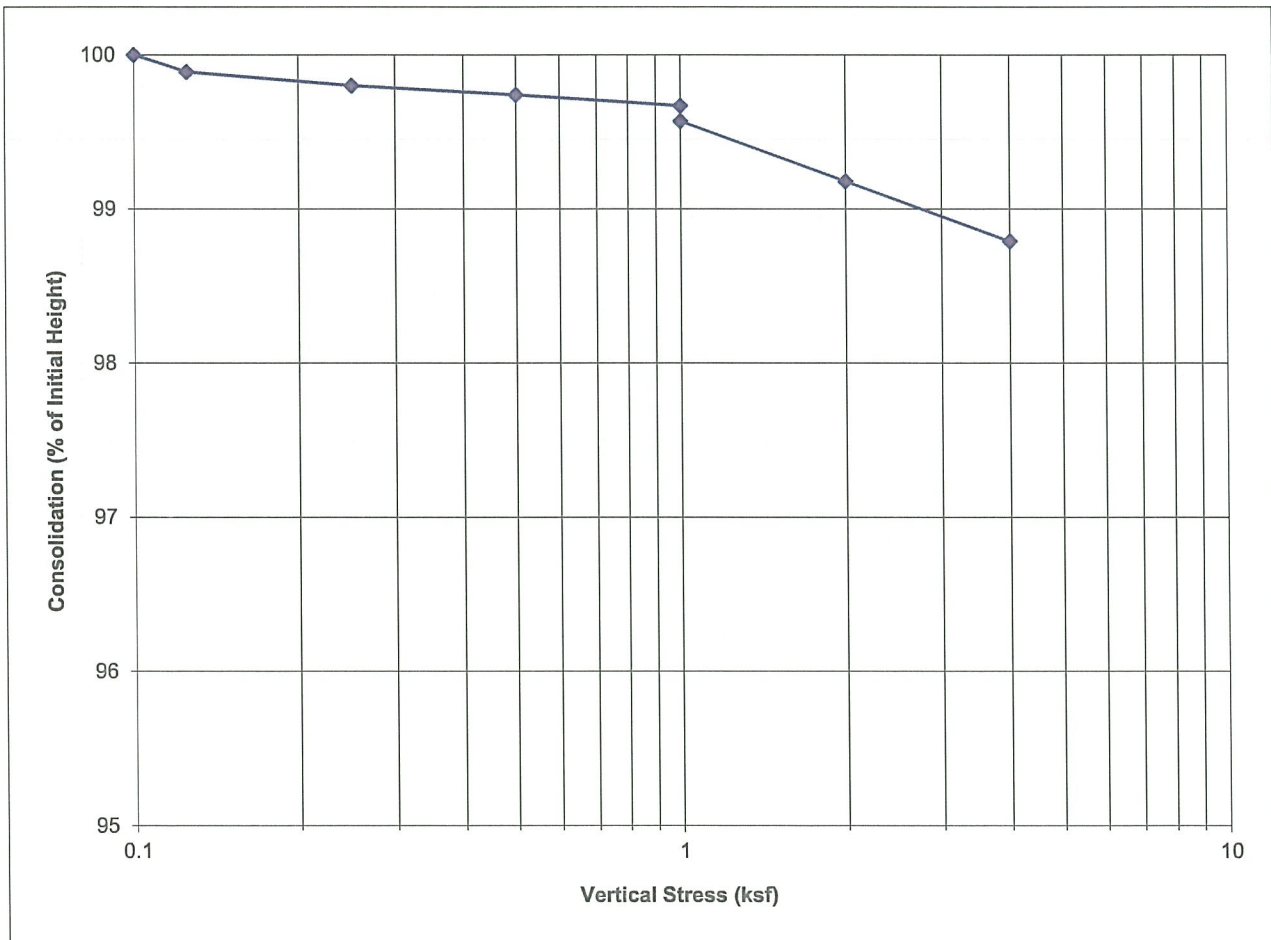


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-7 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 24  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.55
Initial Moisture Content	5.7%	Final Moisture Content	17.1%
Initial Dry Density(pcf)	111.0	Final Dry Density(pcf)	112.3
Initial Degree of Saturation	31%	Final Degree of Saturation	96%
Initial Void Ratio	0.5	Final Void Ratio	0.5
Estimated Specific Gravity	2.65	Saturated at	2 ksf



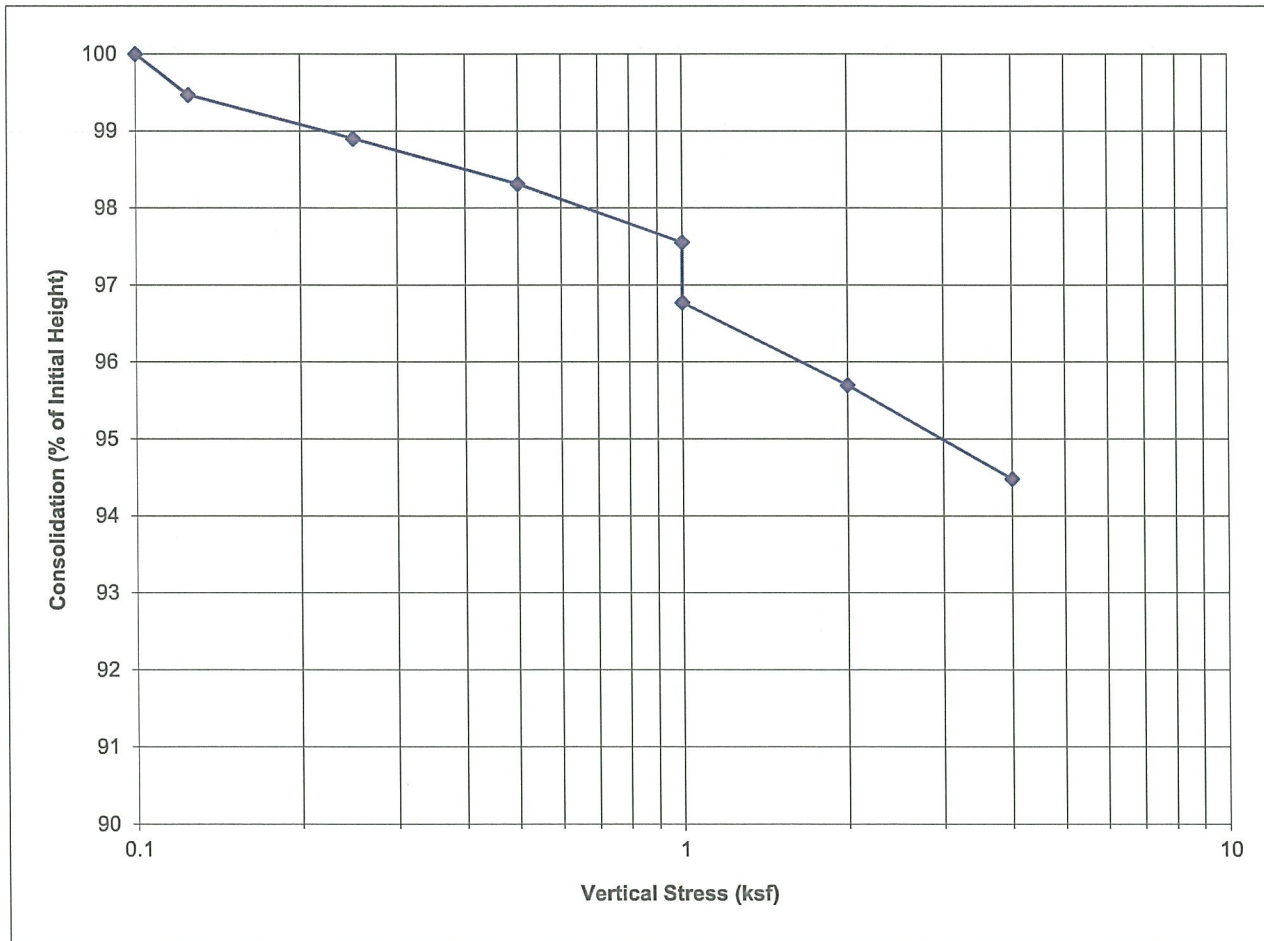


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-8 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 28  
**Date Sampled:** 12/12/16

### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.35
Initial Moisture Content	11.6%	Final Moisture Content	11.6%
Initial Dry Density(pcf)	119.4	Final Dry Density(pcf)	126.3
Initial Degree of Saturation	80%	Final Degree of Saturation	99%
Initial Void Ratio	0.4	Final Void Ratio	0.3
Estimated Specific Gravity	2.65	Saturated at	1 ksf

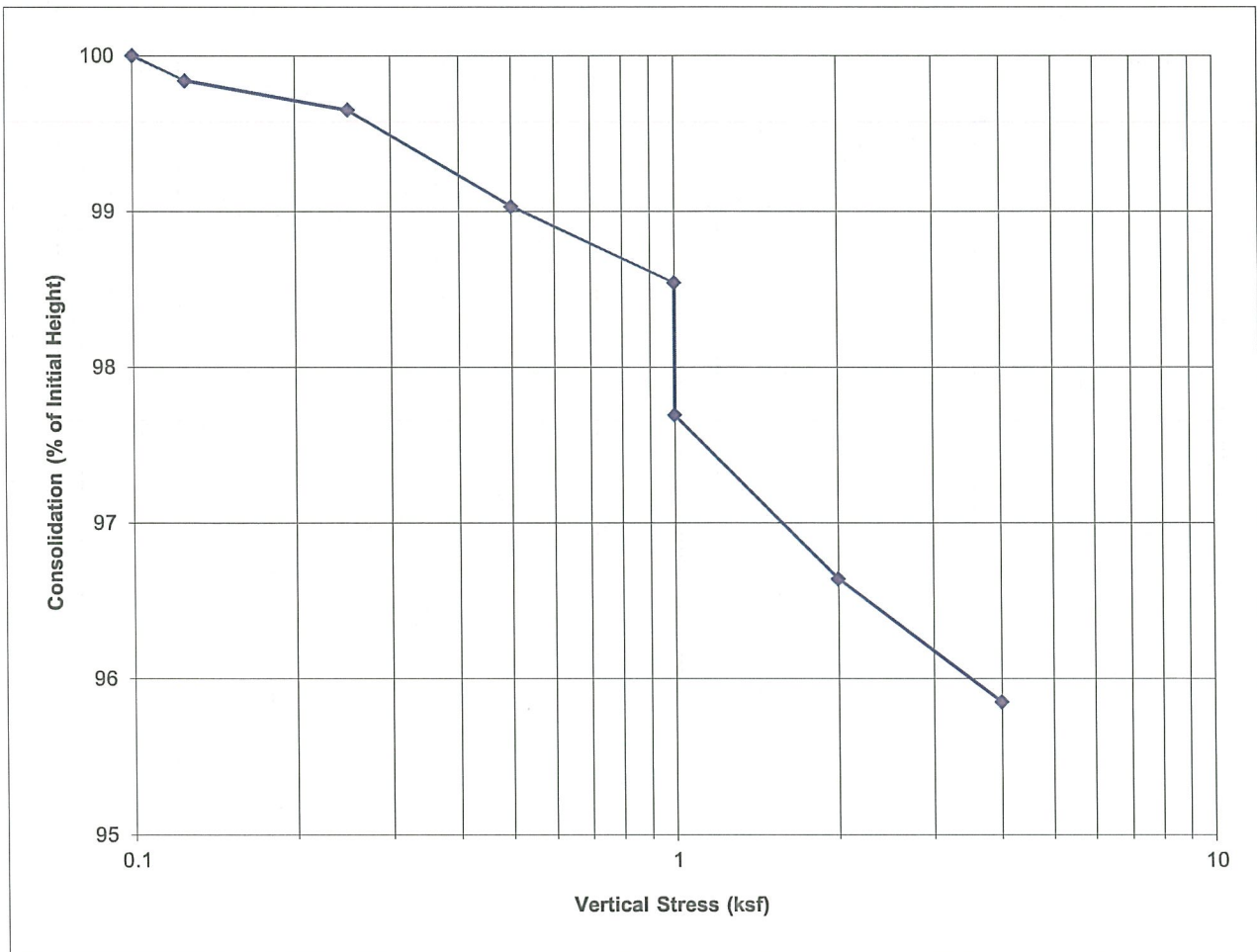


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-9 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 33  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.41
Initial Moisture Content	13.2%	Final Moisture Content	14.4%
Initial Dry Density(pcf)	113.4	Final Dry Density(pcf)	118.3
Initial Degree of Saturation	76%	Final Degree of Saturation	96%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf





**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-10 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 35  
**Date Sampled:** 12/12/16

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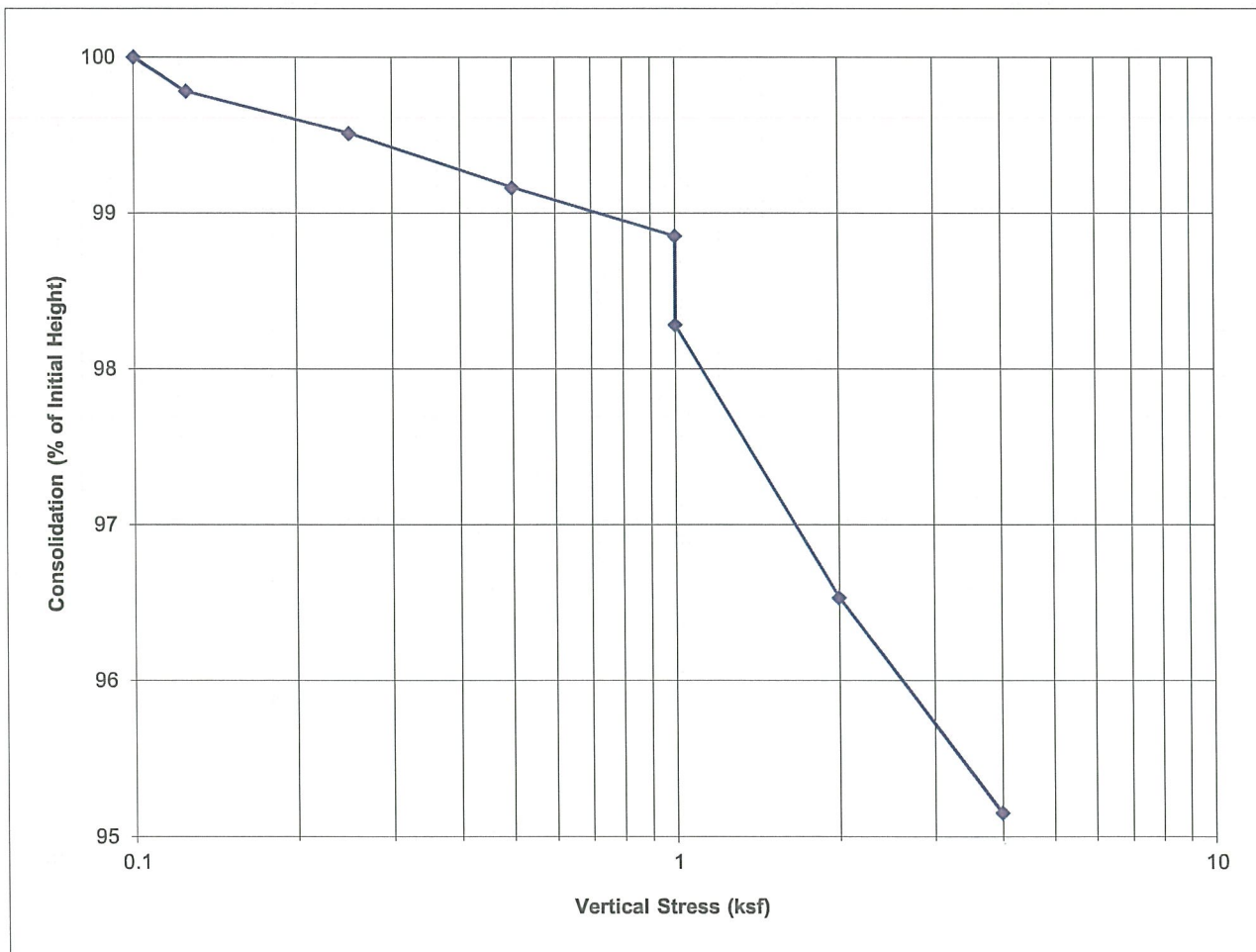
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**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

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Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.38
Initial Moisture Content	5.2%	Final Moisture Content	12.0%
Initial Dry Density(pcf)	118.9	Final Dry Density(pcf)	124.9
Initial Degree of Saturation	35%	Final Degree of Saturation	98%
Initial Void Ratio	0.4	Final Void Ratio	0.3
Estimated Specific Gravity	2.65	Saturated at	1 ksf

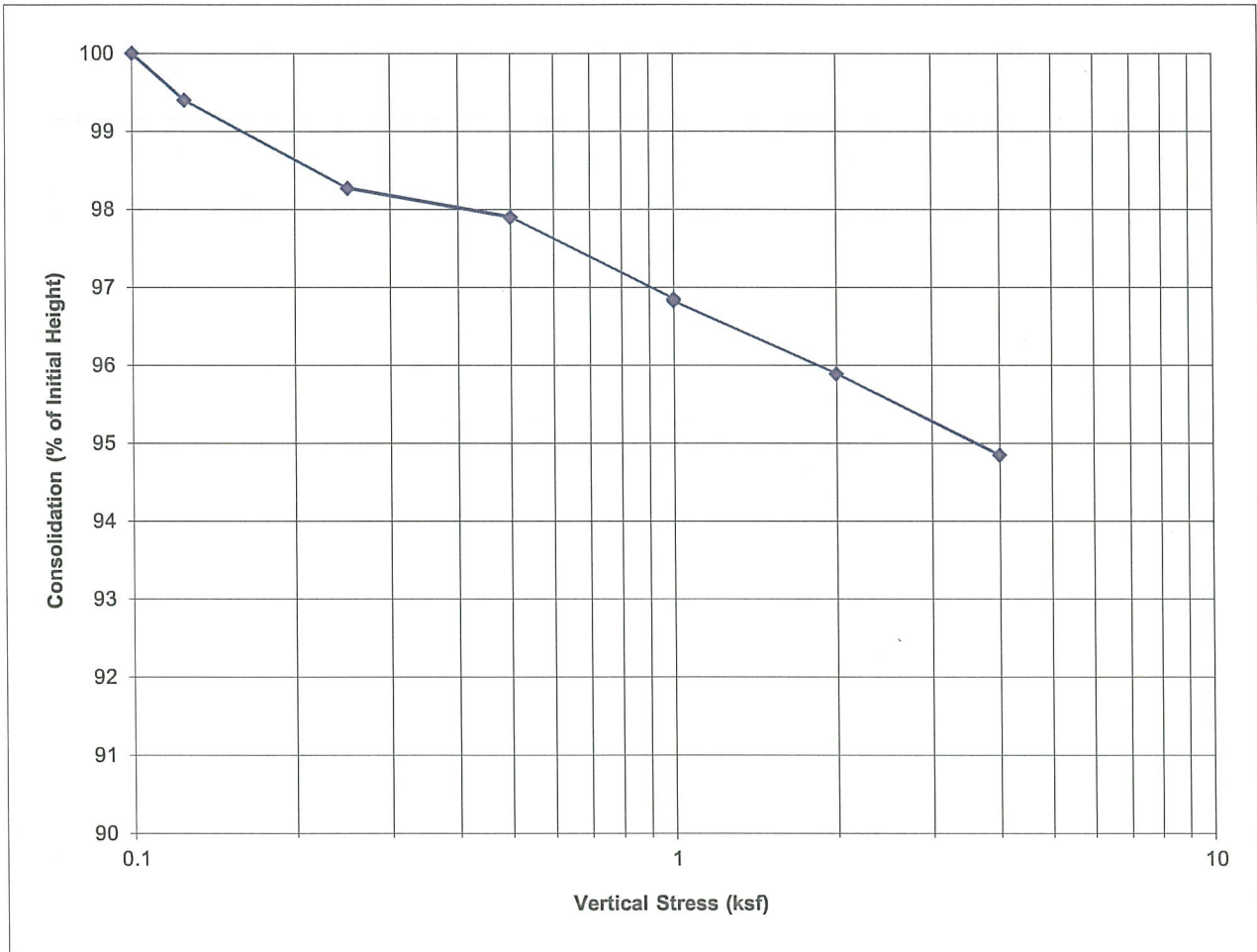


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-11 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 40  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.37
Initial Moisture Content	24.1%	Final Moisture Content	23.3%
Initial Dry Density(pcf)	96.6	Final Dry Density(pcf)	101.8
Initial Degree of Saturation	90%	Final Degree of Saturation	99%
Initial Void Ratio	0.7	Final Void Ratio	0.6
Estimated Specific Gravity	2.65	Saturated at	1 ksf



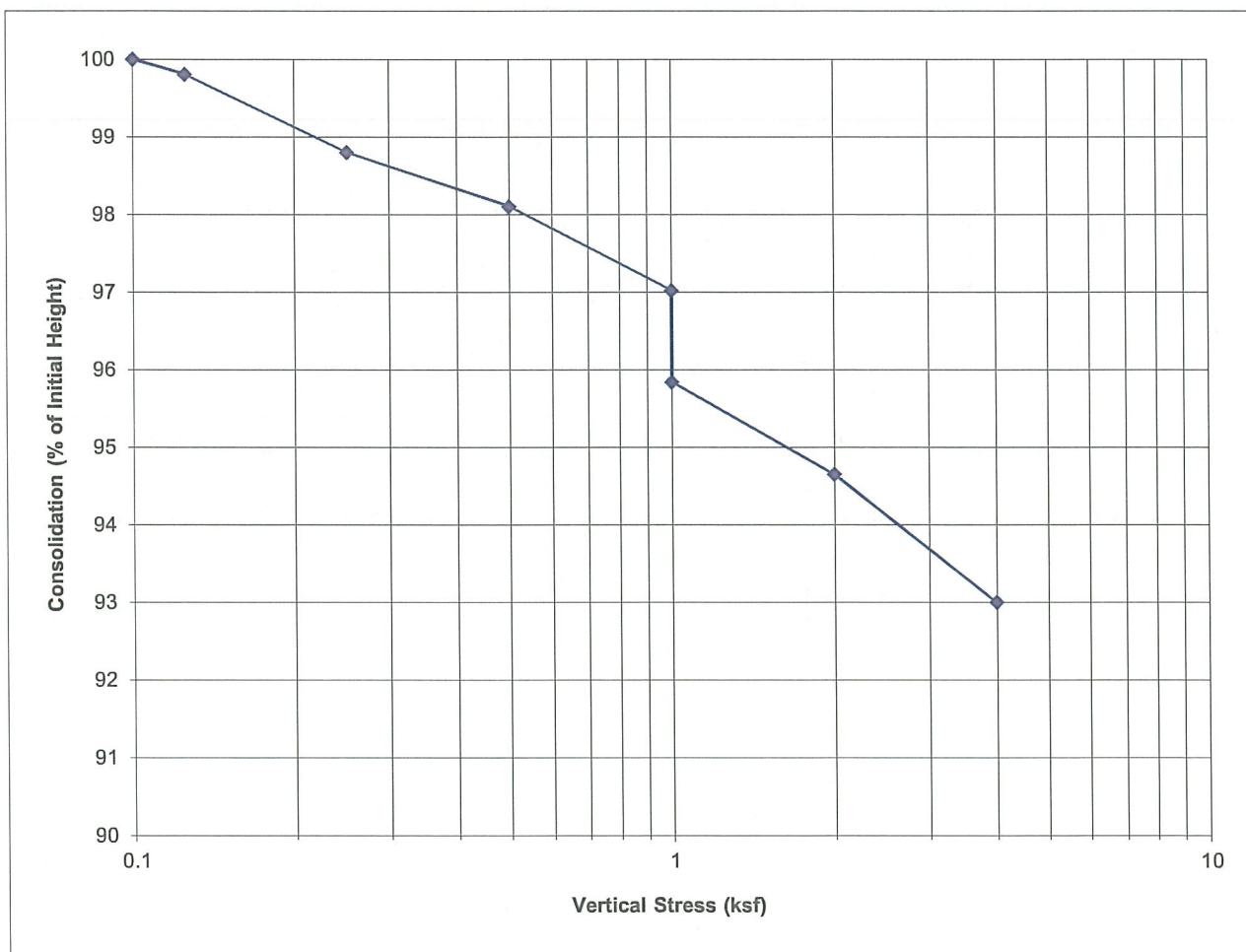


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-12 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 43  
**Date Sampled:** 12/12/16

### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.28
Initial Moisture Content	16.8%	Final Moisture Content	20.4%
Initial Dry Density(pcf)	98.8	Final Dry Density(pcf)	106.2
Initial Degree of Saturation	66%	Final Degree of Saturation	97%
Initial Void Ratio	0.7	Final Void Ratio	0.6
Estimated Specific Gravity	2.65	Saturated at	1 ksf

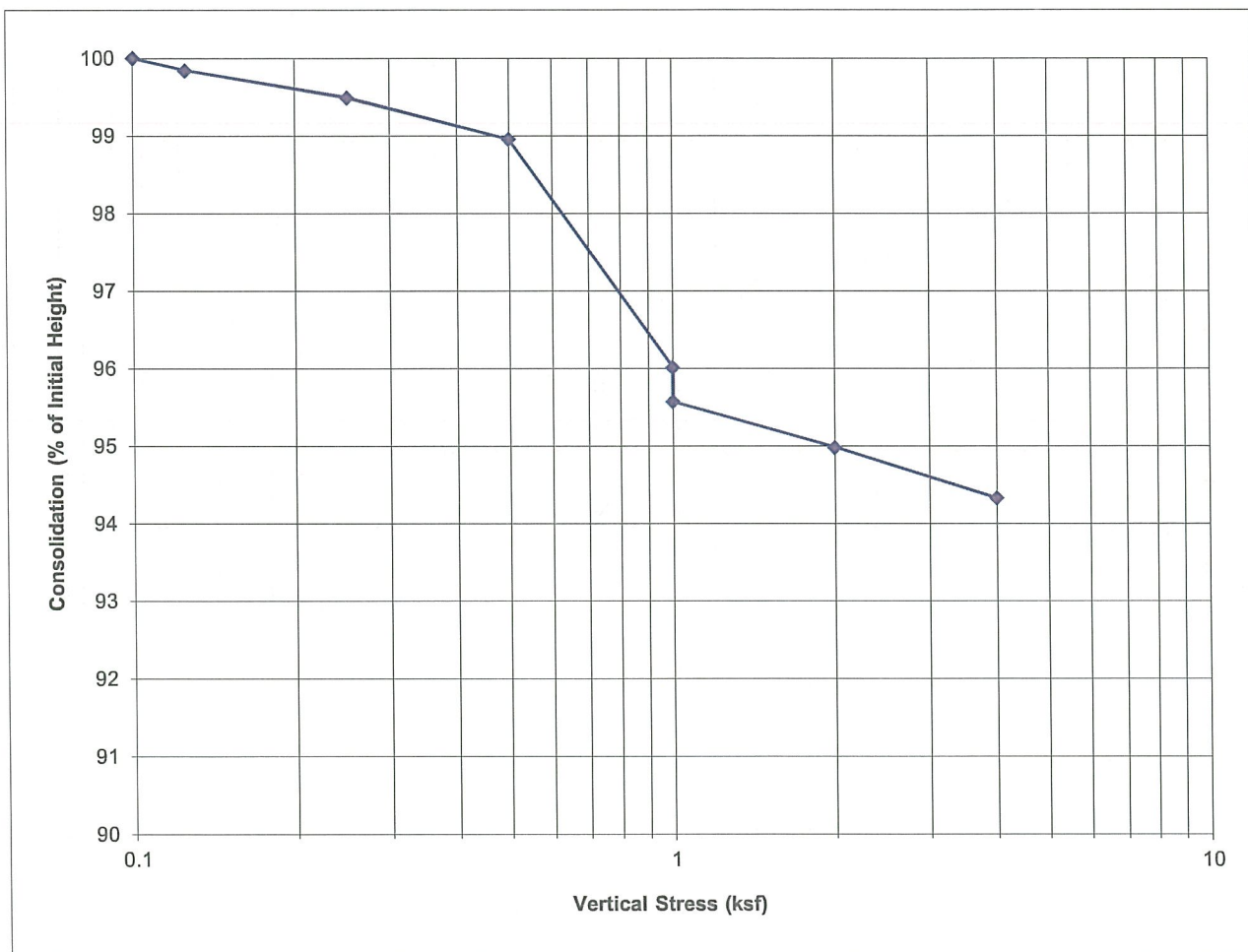


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-13 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 48  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.34
Initial Moisture Content	19.5%	Final Moisture Content	18.1%
Initial Dry Density(pcf)	105.4	Final Dry Density(pcf)	111.7
Initial Degree of Saturation	91%	Final Degree of Saturation	100%
Initial Void Ratio	0.6	Final Void Ratio	0.5
Estimated Specific Gravity	2.65	Saturated at	1 ksf



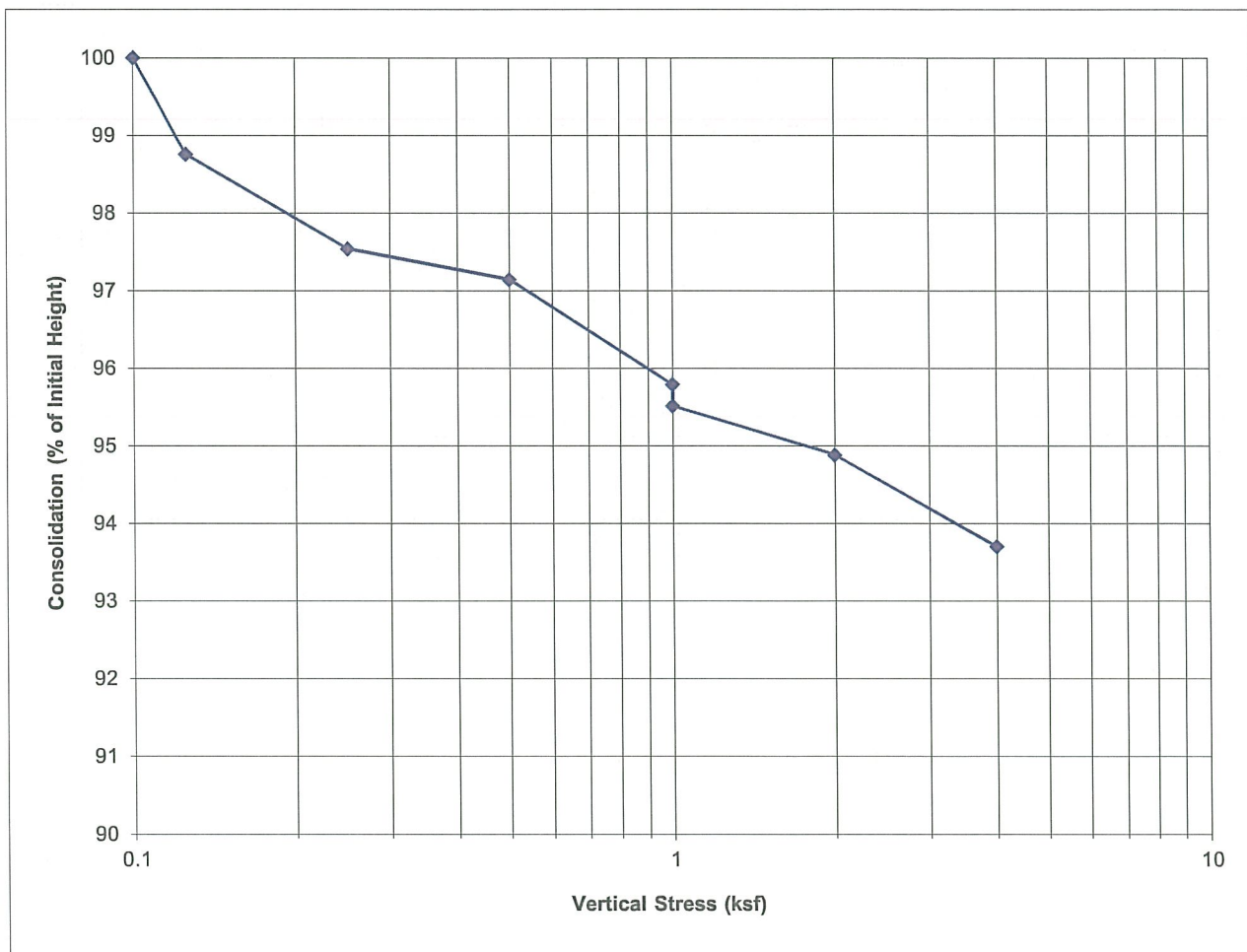


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-14 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 50  
**Date Sampled:** 12/12/16

### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.31
Initial Moisture Content	15.1%	Final Moisture Content	13.4%
Initial Dry Density(pcf)	114.3	Final Dry Density(pcf)	122.0
Initial Degree of Saturation	89%	Final Degree of Saturation	100%
Initial Void Ratio	0.4	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf

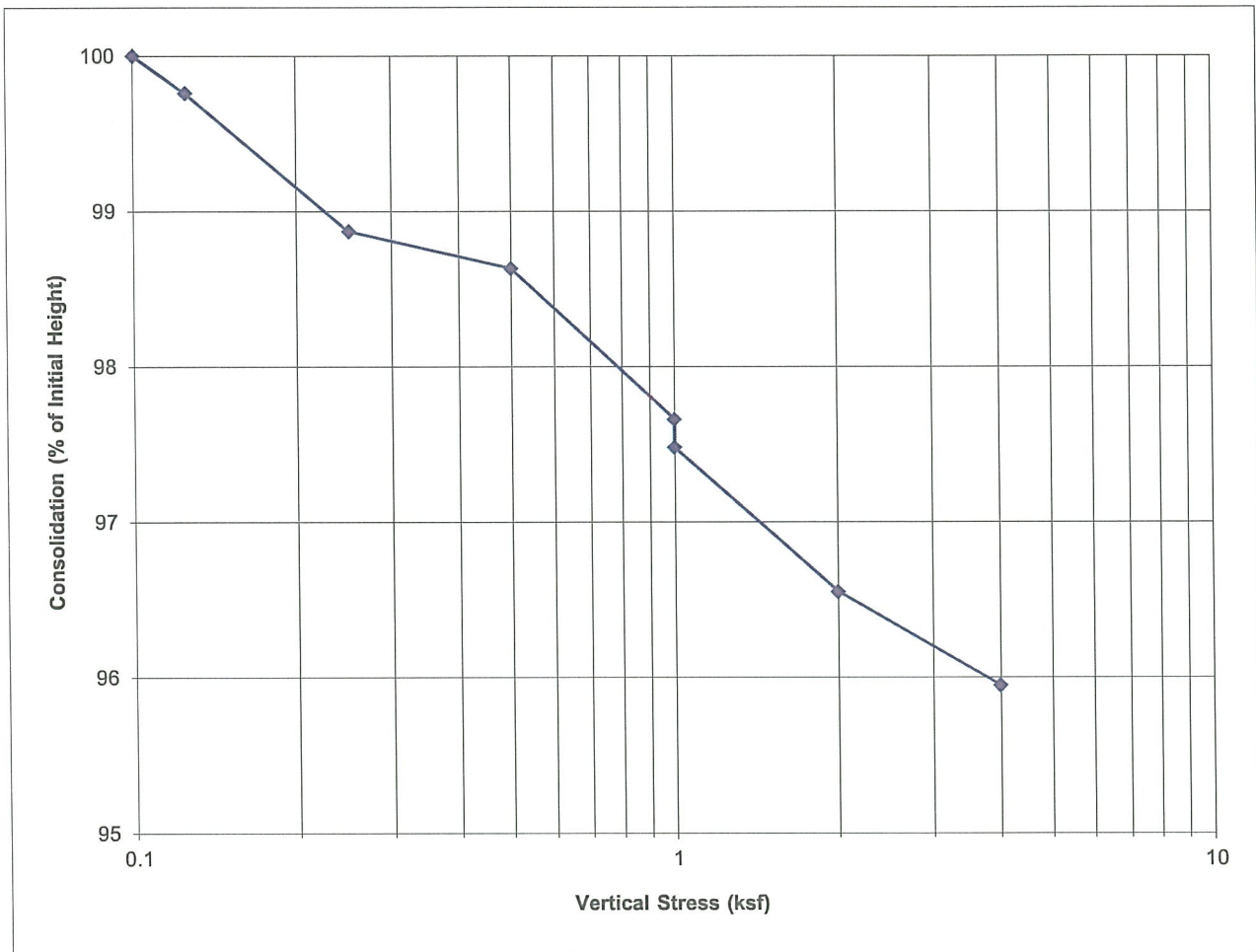


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-15 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 55  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.42
Initial Moisture Content	11.1%	Final Moisture Content	9.6%
Initial Dry Density(pcf)	126.2	Final Dry Density(pcf)	131.4
Initial Degree of Saturation	95%	Final Degree of Saturation	98%
Initial Void Ratio	0.3	Final Void Ratio	0.3
Estimated Specific Gravity	2.65	Saturated at	1 ksf





**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-16 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 59  
**Date Sampled:** 12/12/16

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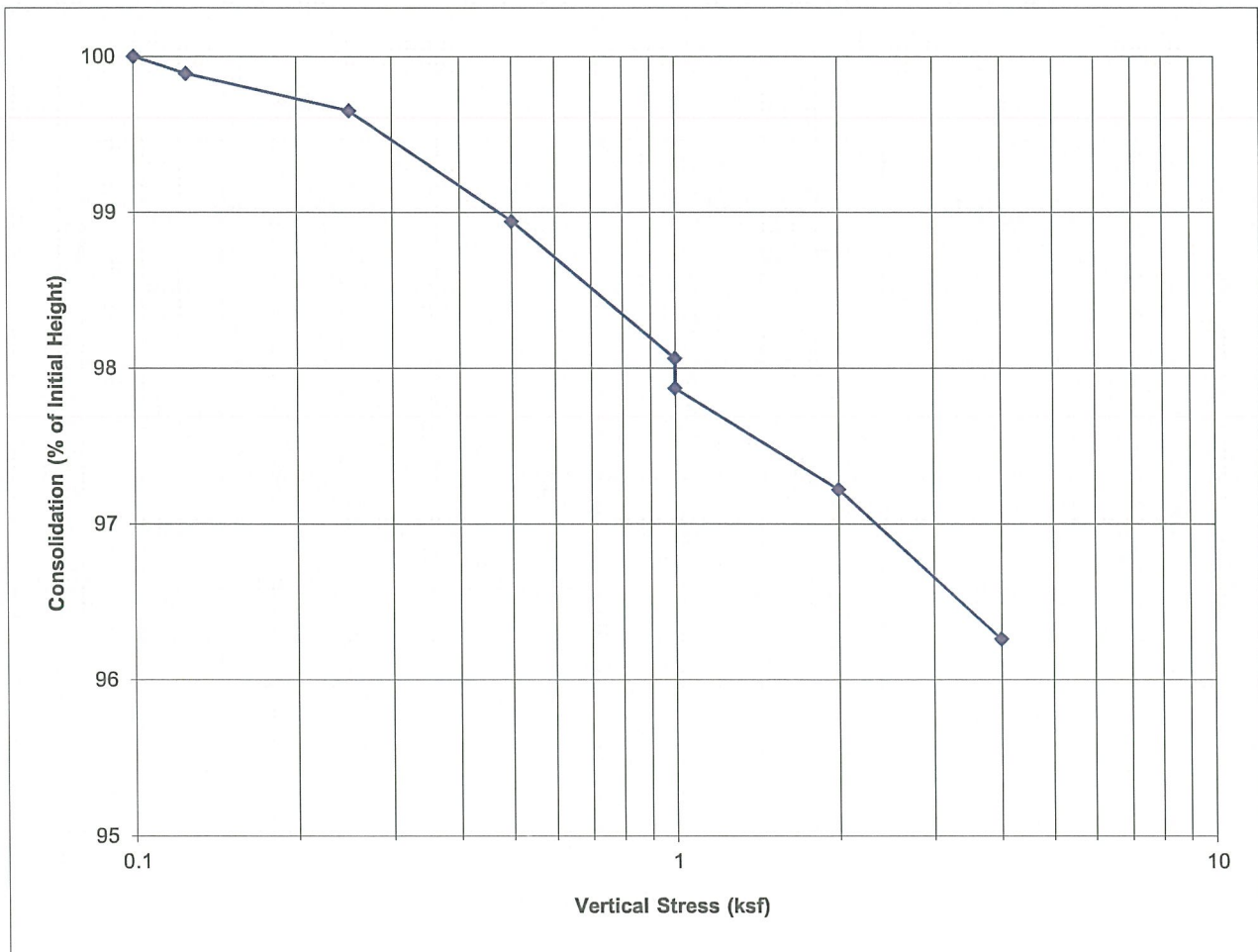
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**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

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Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.43
Initial Moisture Content	15.1%	Final Moisture Content	15.1%
Initial Dry Density(pcf)	113.2	Final Dry Density(pcf)	117.5
Initial Degree of Saturation	87%	Final Degree of Saturation	98%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf

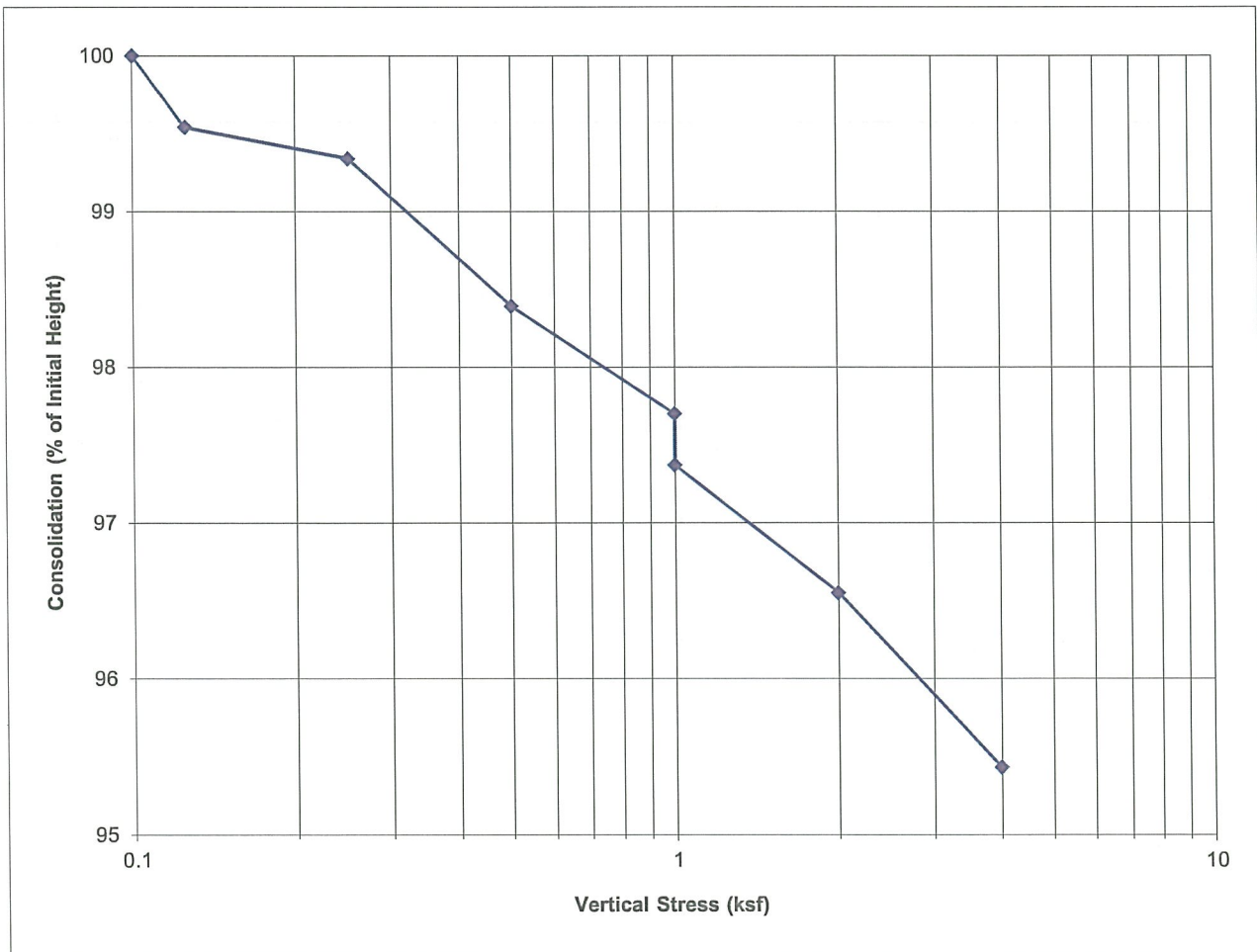


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-17 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 60  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.39
Initial Moisture Content	7.1%	Final Moisture Content	13.5%
Initial Dry Density(pcf)	116.1	Final Dry Density(pcf)	121.6
Initial Degree of Saturation	44%	Final Degree of Saturation	99%
Initial Void Ratio	0.4	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf



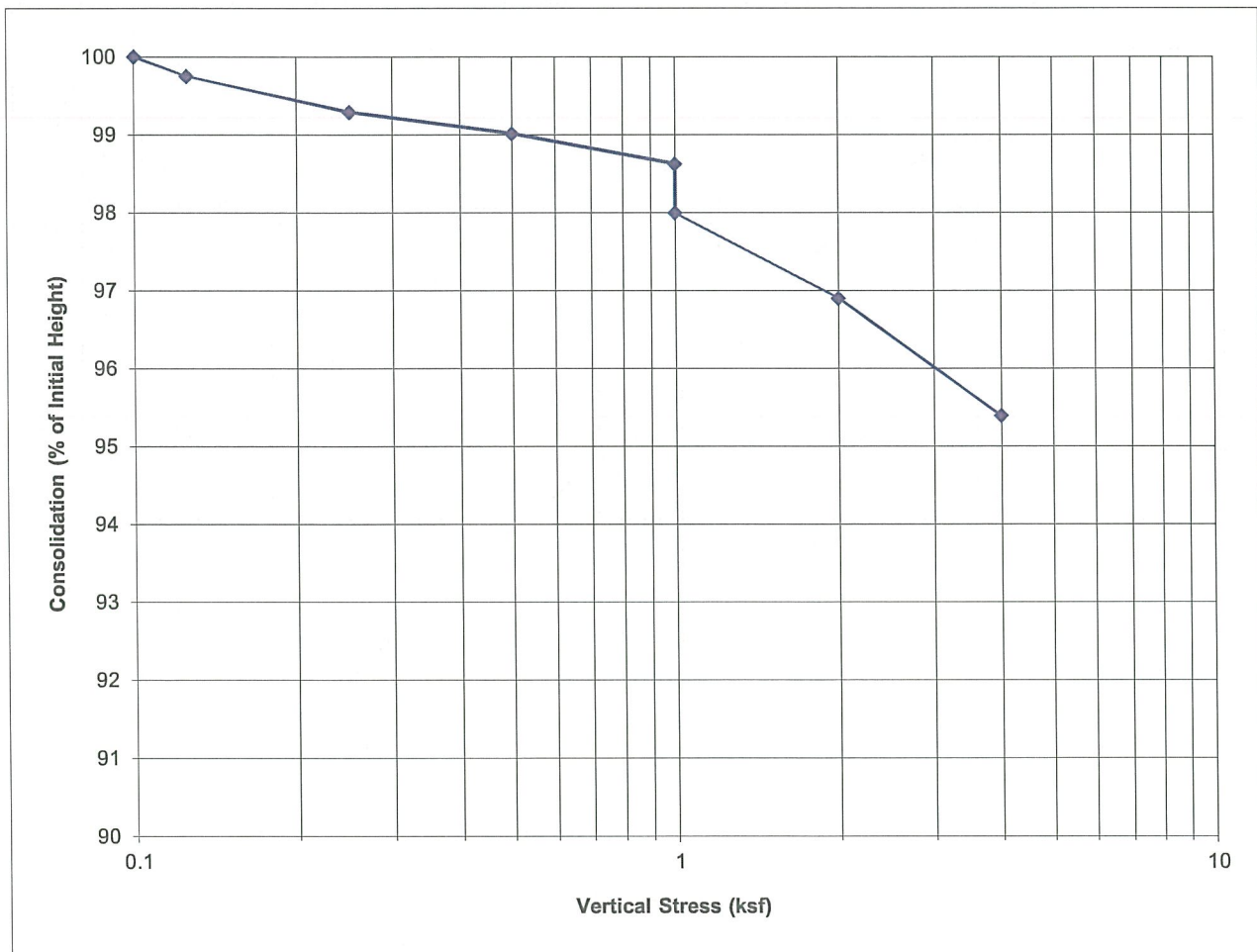


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-18 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 65  
**Date Sampled:** 12/12/16

### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.39
Initial Moisture Content	18.7%	Final Moisture Content	19.8%
Initial Dry Density(pcf)	102.5	Final Dry Density(pcf)	107.4
Initial Degree of Saturation	81%	Final Degree of Saturation	97%
Initial Void Ratio	0.6	Final Void Ratio	0.5
Estimated Specific Gravity	2.65	Saturated at	1 ksf

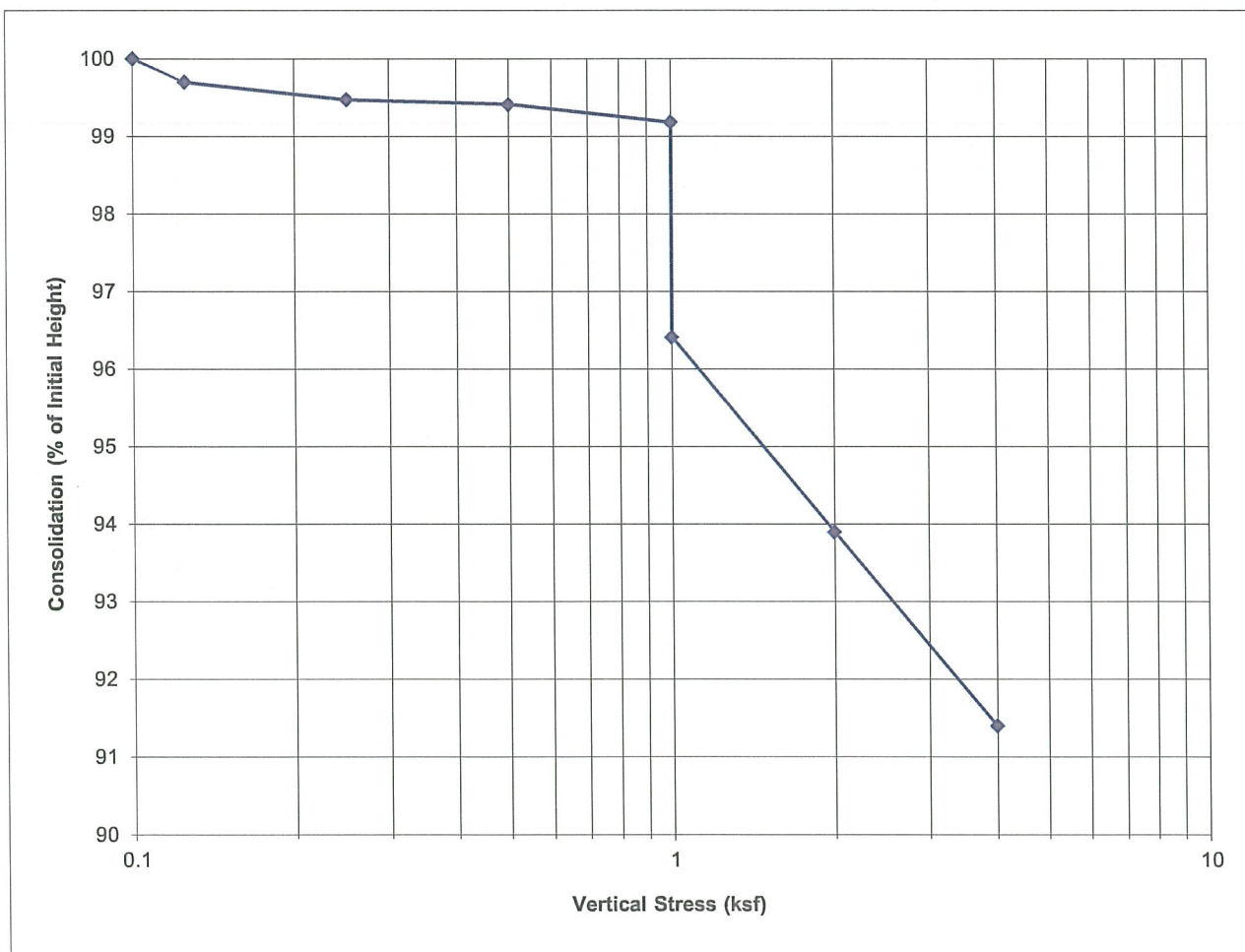


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-19 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 68  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.21
Initial Moisture Content	6.5%	Final Moisture Content	14.0%
Initial Dry Density(pcf)	110.3	Final Dry Density(pcf)	120.6
Initial Degree of Saturation	34%	Final Degree of Saturation	100%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	1 ksf

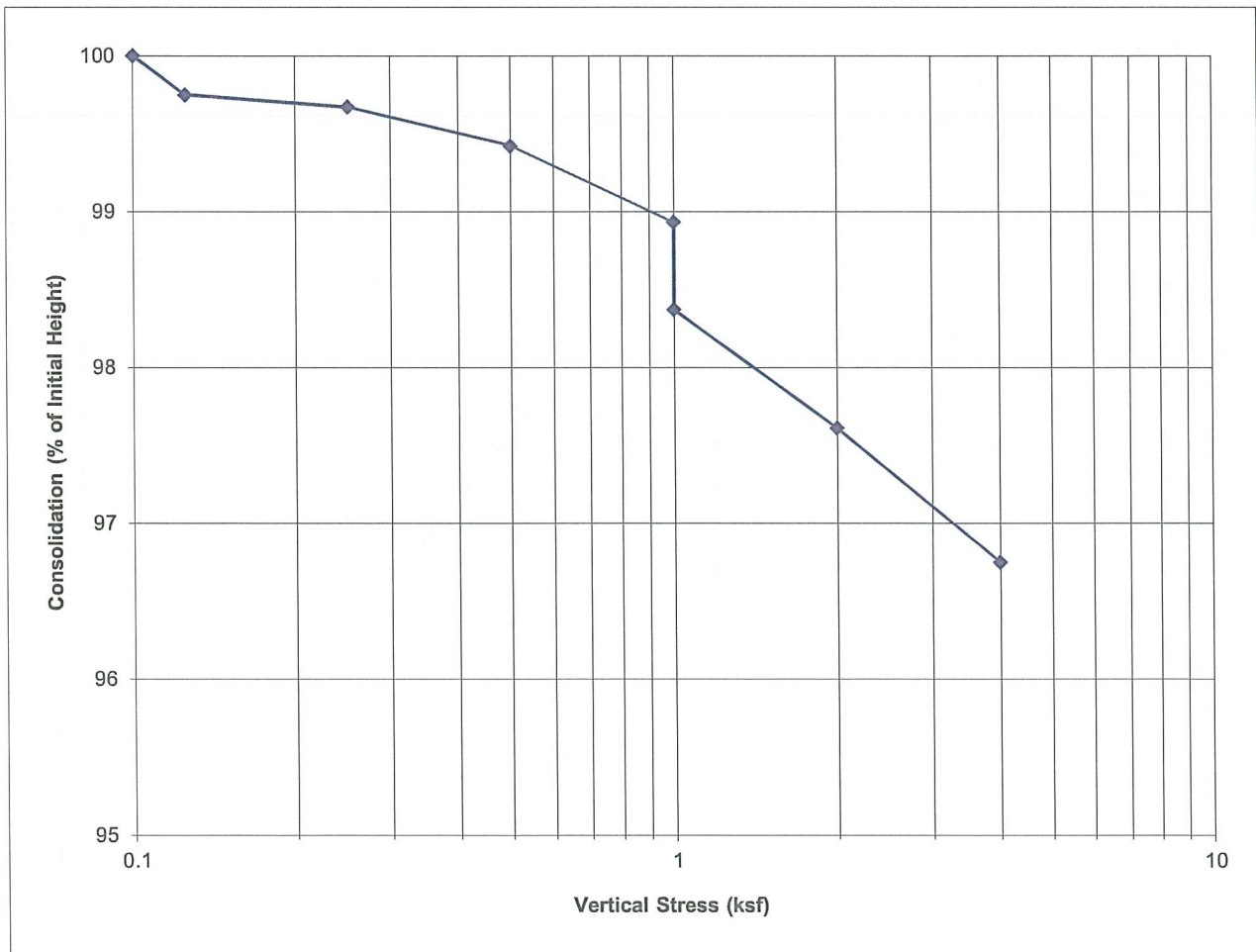


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-20 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 73  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.45
Initial Moisture Content	18.3%	Final Moisture Content	17.4%
Initial Dry Density(pcf)	108.4	Final Dry Density(pcf)	112.0
Initial Degree of Saturation	92%	Final Degree of Saturation	97%
Initial Void Ratio	0.5	Final Void Ratio	0.5
Estimated Specific Gravity	2.65	Saturated at	1 ksf

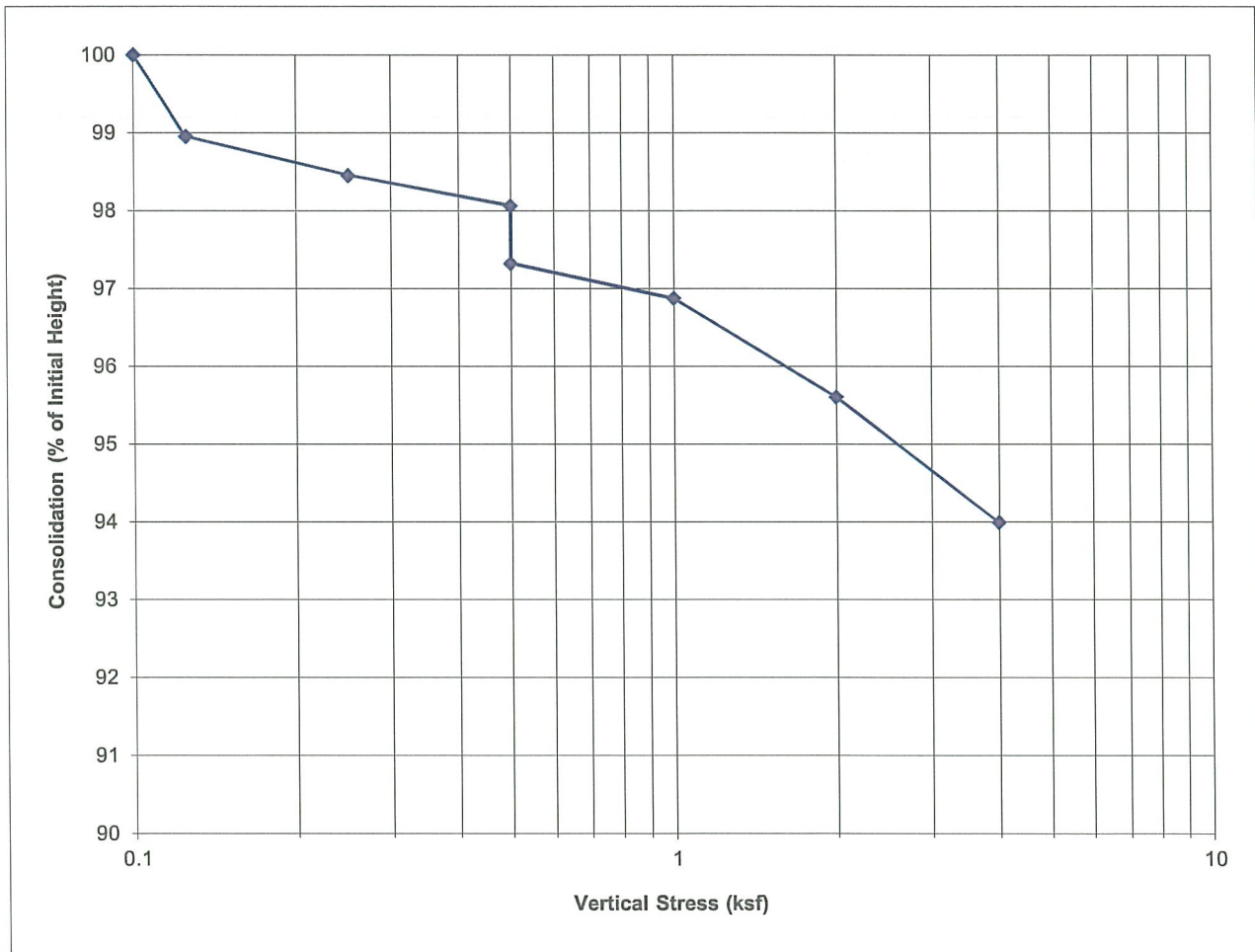


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-21 @ 0.2'-1.7'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 75  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.33
Initial Moisture Content	17.1%	Final Moisture Content	15.1%
Initial Dry Density(pcf)	110.9	Final Dry Density(pcf)	117.9
Initial Degree of Saturation	92%	Final Degree of Saturation	99%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf

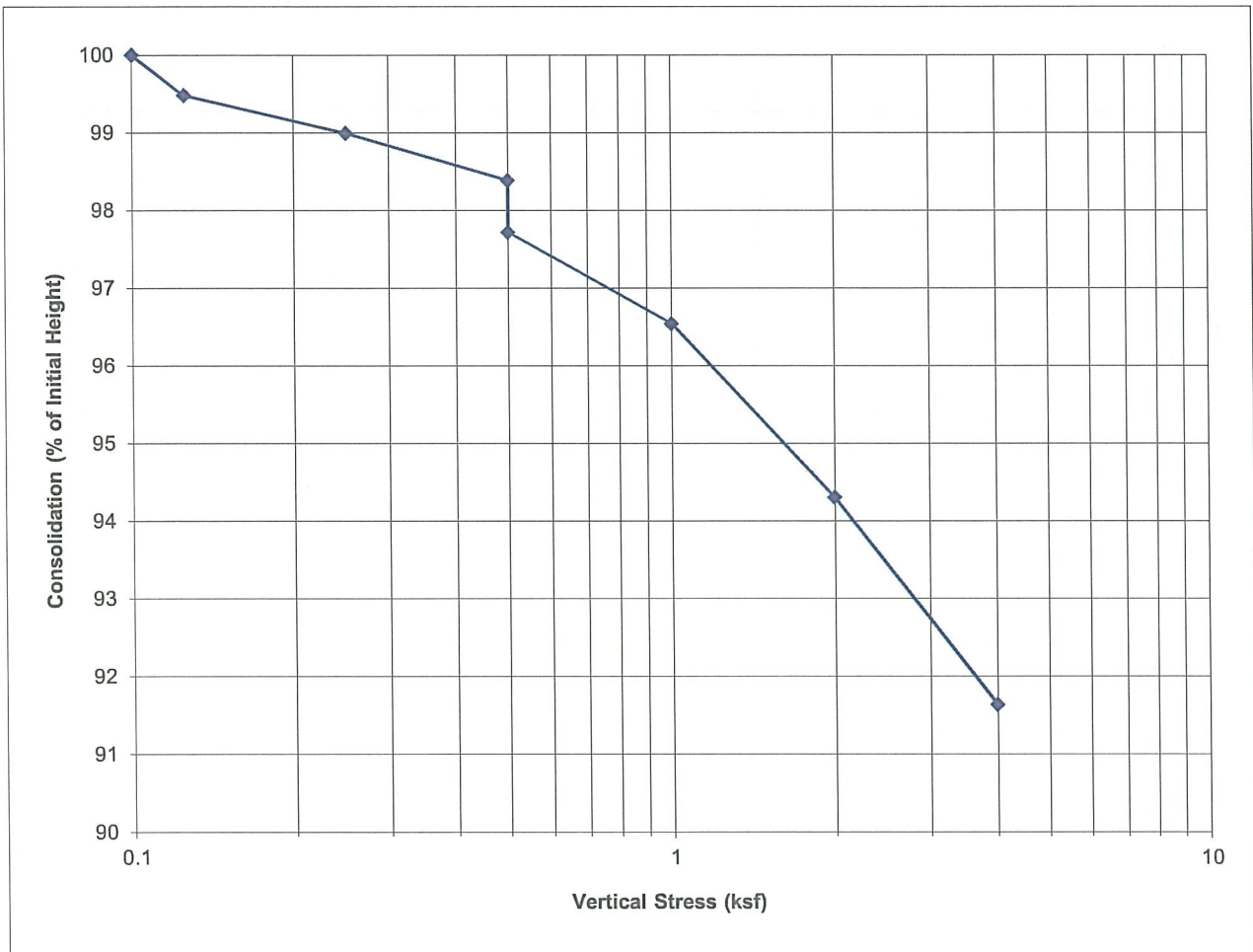


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-22 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 80  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.22
Initial Moisture Content	19.4%	Final Moisture Content	18.5%
Initial Dry Density(pcf)	102.2	Final Dry Density(pcf)	111.5
Initial Degree of Saturation	83%	Final Degree of Saturation	101%
Initial Void Ratio	0.6	Final Void Ratio	0.5
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf

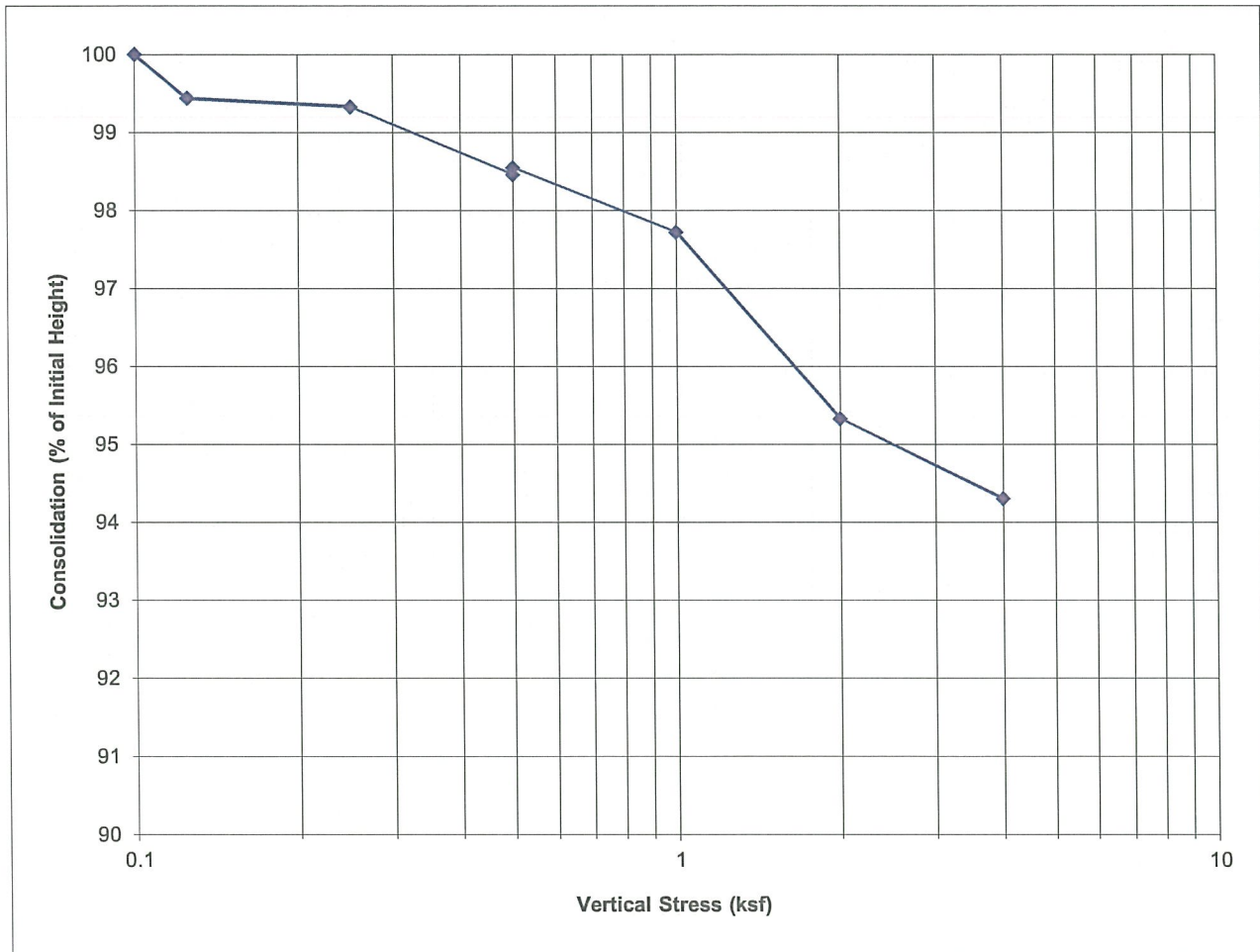


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-23 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 83  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.34
Initial Moisture Content	14.6%	Final Moisture Content	11.5%
Initial Dry Density(pcf)	119.1	Final Dry Density(pcf)	126.3
Initial Degree of Saturation	100%	Final Degree of Saturation	98%
Initial Void Ratio	0.4	Final Void Ratio	0.3
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf





**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-24 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 88  
**Date Sampled:** 12/12/16

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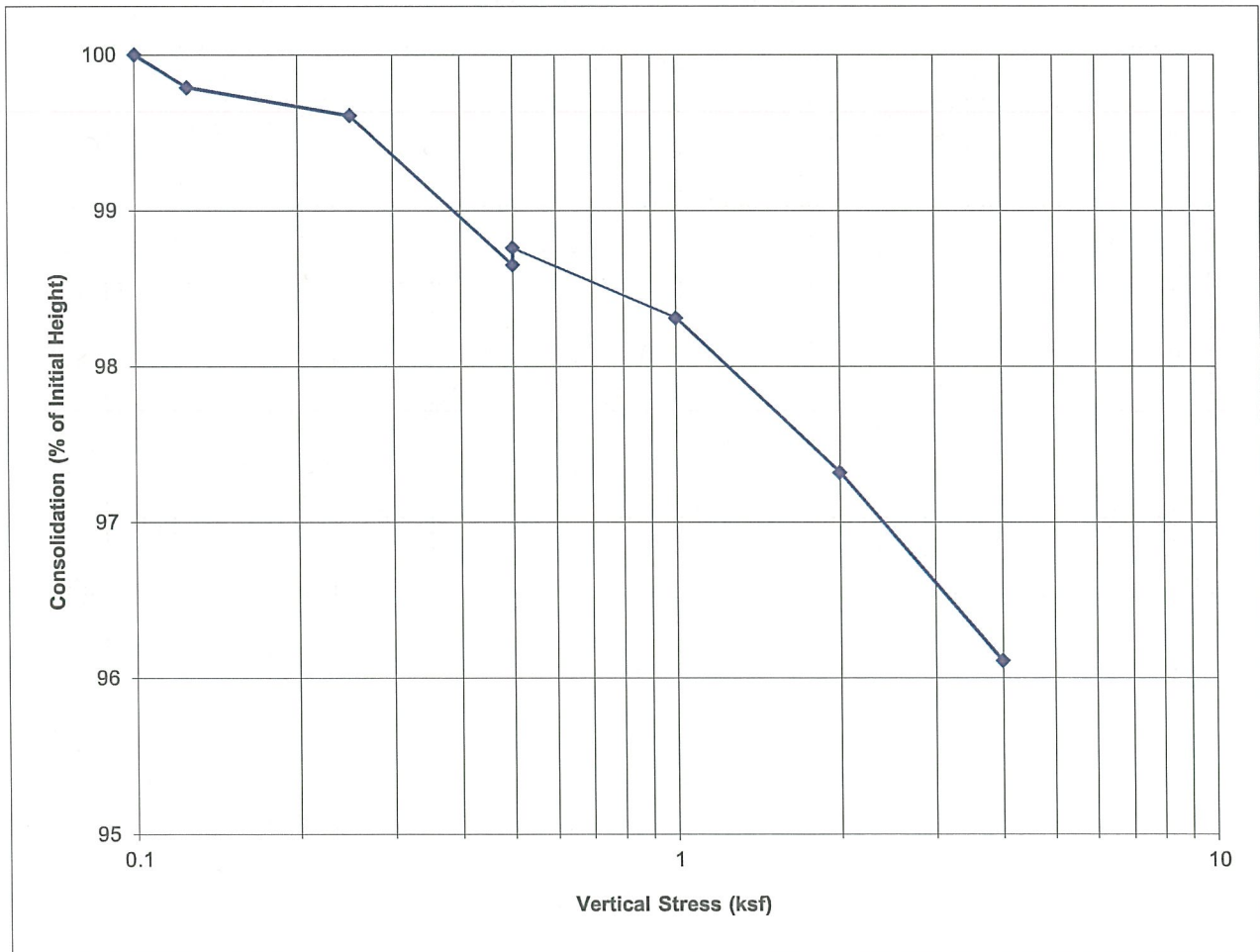
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**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

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Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.43
Initial Moisture Content	16.5%	Final Moisture Content	16.7%
Initial Dry Density(pcf)	109.3	Final Dry Density(pcf)	113.7
Initial Degree of Saturation	85%	Final Degree of Saturation	97%
Initial Void Ratio	0.5	Final Void Ratio	0.5
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf

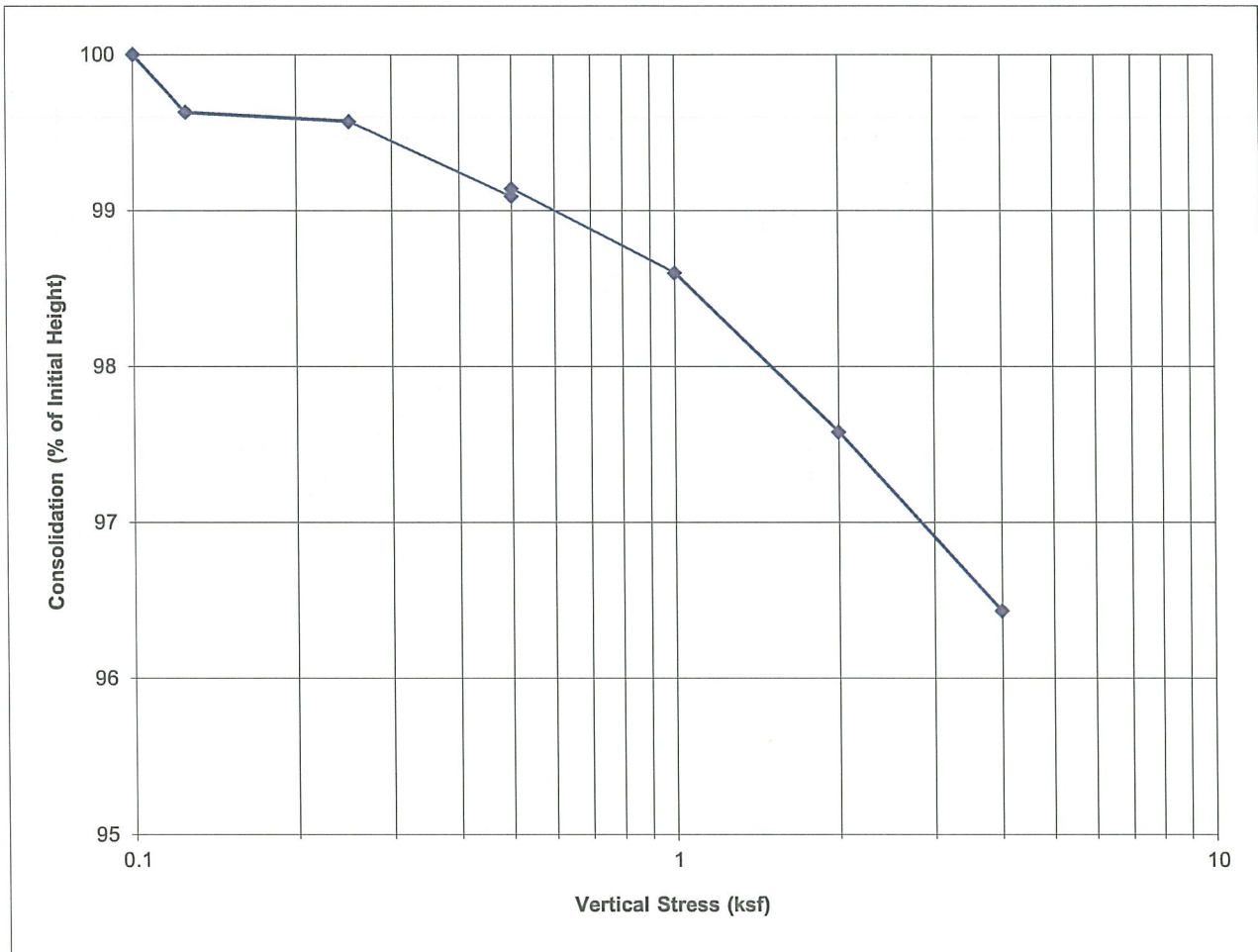


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-25 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 91  
**Date Sampled:** 12/12/16

**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.44
Initial Moisture Content	14.7%	Final Moisture Content	12.7%
Initial Dry Density(pcf)	119.6	Final Dry Density(pcf)	123.9
Initial Degree of Saturation	101%	Final Degree of Saturation	100%
Initial Void Ratio	0.4	Final Void Ratio	0.3
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf





**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-26 @ 2.5'-4.0'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 94  
**Date Sampled:** 12/12/16

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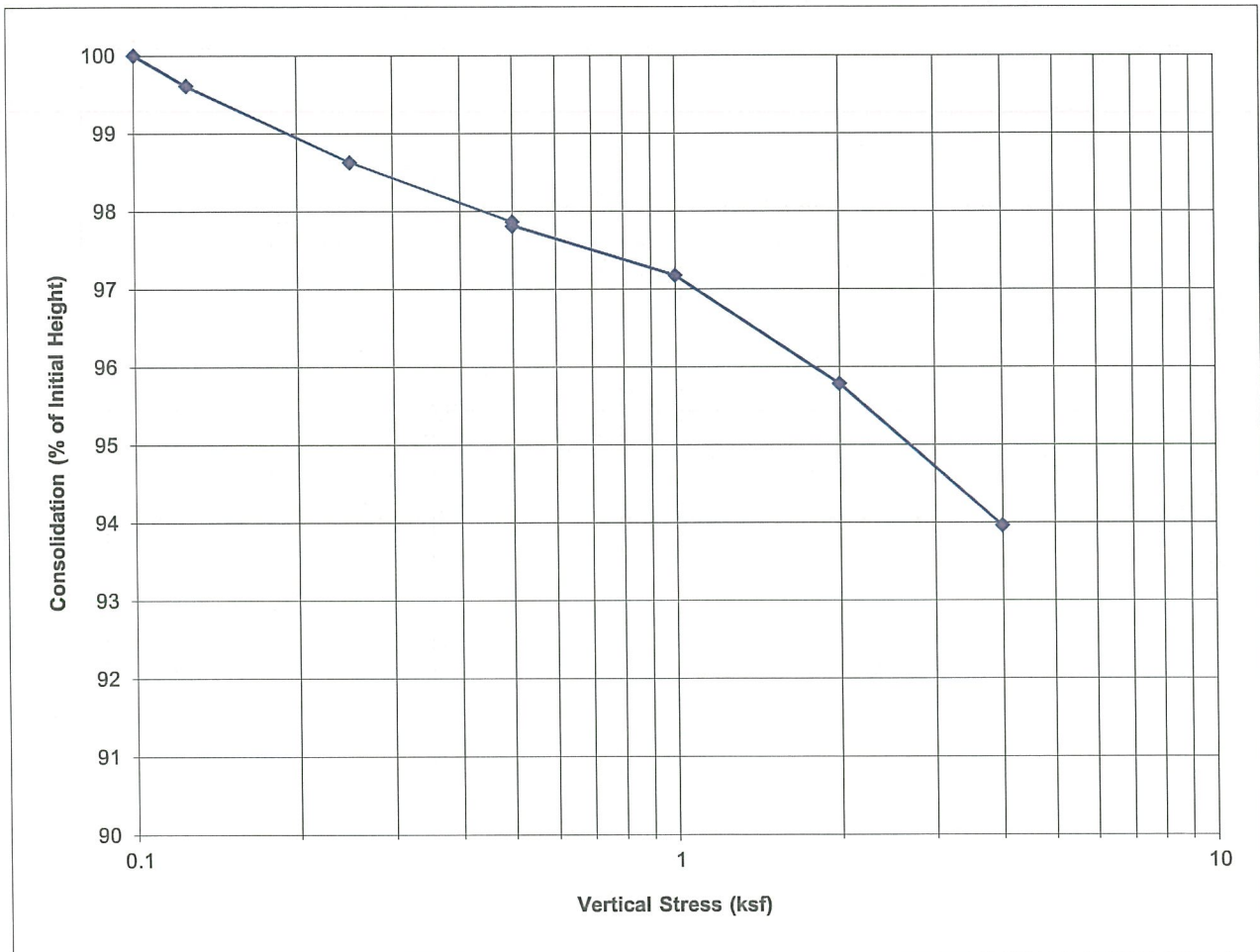
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**One-Dimensional Consolidation Properties of Soils (ASTM D2435)**

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Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.33
Initial Moisture Content	4.5%	Final Moisture Content	14.1%
Initial Dry Density(pcf)	113.1	Final Dry Density(pcf)	120.3
Initial Degree of Saturation	26%	Final Degree of Saturation	100%
Initial Void Ratio	0.5	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf

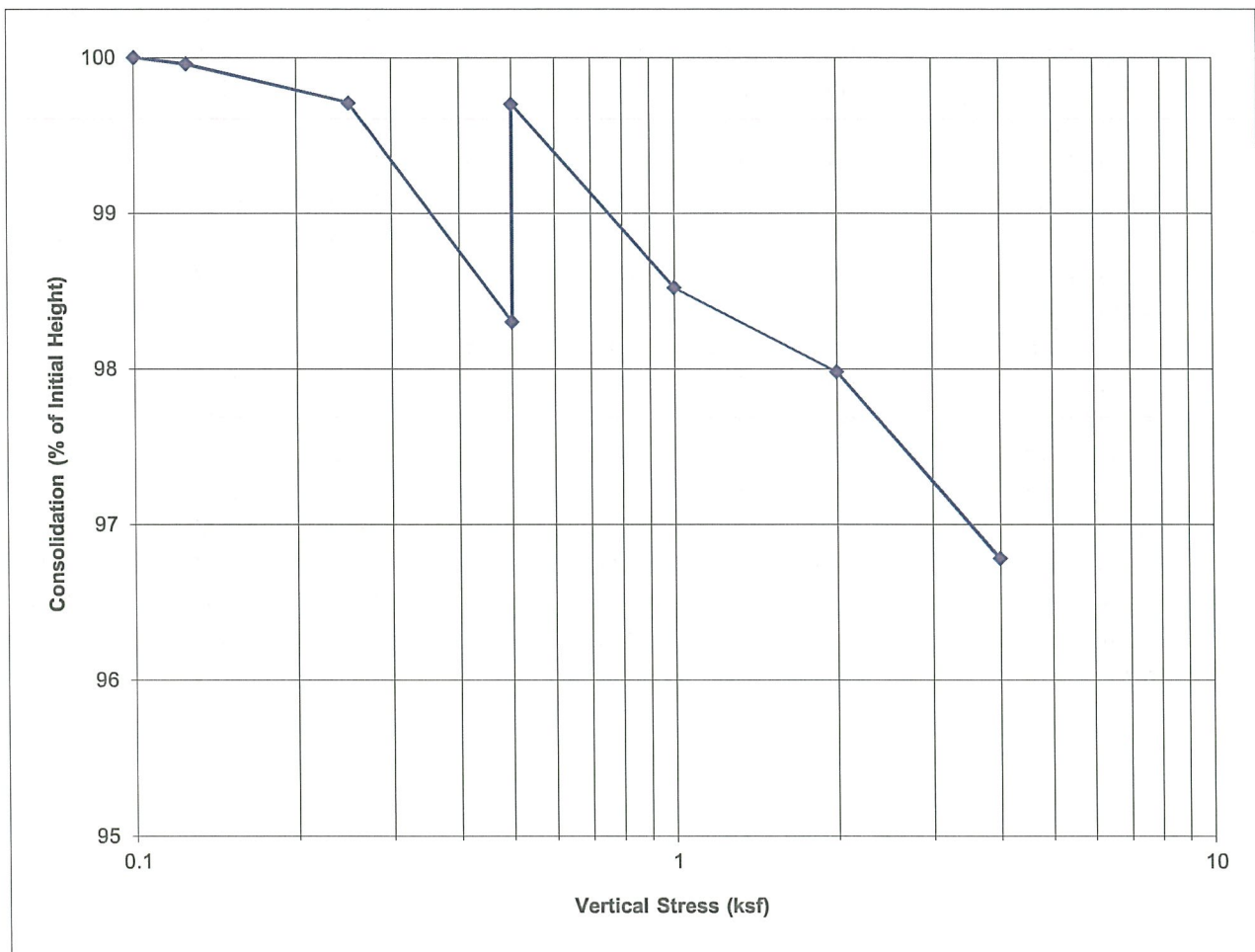


**Project:** Shiprock Airstrip  
**Project Location:** Shiprock, NM  
**Client:** Armstrong Consultants  
**Material:** Native  
**Sample Source:** Ring Sample B-27 @ 4.0'-5.5'  
**Sample Prep:** In-Situ

**Project Number:** 150133  
**Work Order Number:** 1610672  
**Lab Number:** 99  
**Date Sampled:** 12/12/16

### One-Dimensional Consolidation Properties of Soils (ASTM D2435)

Initial Volume (cu.in)	4.60	Final Volume (cu.in)	4.46
Initial Moisture Content	14.8%	Final Moisture Content	14.5%
Initial Dry Density(pcf)	115.2	Final Dry Density(pcf)	118.9
Initial Degree of Saturation	90%	Final Degree of Saturation	99%
Initial Void Ratio	0.4	Final Void Ratio	0.4
Estimated Specific Gravity	2.65	Saturated at	0.5 ksf





PROJECT: Shiprock Airstrip  
 LOCATION: Shiprock, New Mexico  
 SAMPLE DATE: 12/12/2016

PROJECT: 150133  
 WORK ORDER: 1610672  
 REVIEWED BY: J Floyd

DENSITY OF SOIL IN PLACE BY THE DRIVE-CYLINDER METHOD -- ASTM D 2937

LAB #	SAMPLE SOURCE	#REF1	MOISTURE			# OF RINGS	WET WEIGHT + RINGS (g)	WEIGHT OF RINGS (g)	DRY DENSITY (pcf)
			WET WEIGHT (g)	DRY WEIGHT (g)	MOISTURE CONTENT				
2	B-1 @ 0.2'-1.7'		744.1	712.1	4.5%	5	962.7	218.6	117.9
3	B-1 @ 2.5'-4.0'		906.8	808.9	12.1%	6	1162.4	255.6	111.6
4	B-1 @ 4.0'-5.5'		971.1	878.0	10.6%	6	1237.3	266.2	121.2
6	B-2 @ 0.2'-1.7'		795.7	752.8	5.7%	5	1018.2	222.5	124.7
7	B-2 @ 2.5'-4.0'		419.9	355.1	18.2%	3	551.9	132.0	98.0
8	B-2 @ 4.0'-5.5'		792.7	721.9	9.8%	5	1012.2	219.5	119.5
9	B-3 @ 0.2'-1.7'		988.9	939.1	5.3%	6	1204.5	215.6	129.6
10	B-3 @ 2.5'-4.0'		777.5	694.8	11.9%	5	997.5	220.0	115.1
11	B-3 @ 4.0'-5.2'		783.2	713.9	9.7%	5	1008.3	225.1	118.2
13	B-4 @ 0.2'-1.7'		733.2	695.0	5.5%	5	953.5	220.3	115.1
14	B-4 @ 2.5'-4.0'		730.8	640.5	14.1%	5	956.0	225.2	106.1
15	B-4 @ 4.0'-5.5'		800.4	718.5	11.4%	5	1014.0	213.6	119.0
16	B-5 @ 0.2'-1.7'		609.0	575.6	5.8%	4	780.0	171.0	119.1
17	B-5 @ 2.5'-4.0'		622.8	566.2	10.0%	4	804.0	181.2	117.2
18	B-5 @ 4.0'-5.5'		765.7	703.1	8.9%	5	988.5	222.8	116.4
20	B-6 @ 0.2'-1.7'		748.5	713.5	4.9%	5	969.8	221.3	118.2
21	B-6 @ 2.5'-4.0'		819.0	734.5	11.5%	5	1031.3	212.3	121.6
22	B-6 @ 4.0'-5.5'		640.6	572.5	11.9%	4	815.6	175.0	118.5
24	B-7 @ 0.2'-1.7'		618.8	595.6	3.9%	4	792.3	193.5	119.3
25	B-7 @ 2.5'-4.0'		801.5	722.7	10.9%	5	1020.0	218.6	119.7
26	B-7 @ 4.0'-5.5'		664.9	600.0	10.8%	4	843.3	178.4	124.2

REMARKS:

PROJECT: Shiprock Airstrip  
 LOCATION: Shiprock, New Mexico  
 SAMPLE DATE: 12/12/2016

PROJECT: 150133  
 WORK ORDER: 1610672  
 REVIEWED BY: J Floyd

DENSITY OF SOIL IN PLACE BY THE DRIVE-CYLINDER METHOD -- ASTM D 2937

LAB #	SAMPLE SOURCE	#REF	MOISTURE			# OF RINGS	WET WEIGHT + RINGS (g)	WEIGHT OF RINGS (g)	DRY DENSITY (pcf)
			WET WEIGHT (g)	DRY WEIGHT (g)	MOISTURE CONTENT				
28	B-8 @ 0.2'-1.7'		595.4	569.2	4.6%	4	769.0	173.6	117.8
29	B-8 @ 2.5'-4.0'		487.4	444.7	9.6%	4	660.7	173.3	92.1
30	B-8 @ 4.0'-5.4'		608.5	553.7	9.9%	4	784.2	175.7	114.6
31	B-9 @ 0.3'-1.5'		755.2	715.8	5.5%	5	979.9	224.9	118.5
32	B-9 @ 2.5'-4.0'		988.0	879.0	12.4%	6	1255.0	267.0	121.3
33	B-9 @ 4.0'-5.5'		974.3	866.0	12.5%	6	1240.3	266.0	119.5
35	B-10 @ 0.2'-1.7'		617.6	589.9	4.7%	4	793.2	175.4	122.1
36	B-10 @ 2.5'-4.0'		708.7	614.6	15.3%	5	932.2	223.5	101.8
37	B-10 @ 4.0'-5.5'		918.3	798.5	15.0%	6	1181.3	263.0	110.2
38	B-11 @ 0.2'-1.7'		505.5	487.5	3.7%	4	681.8	176.3	100.9
39	B-11 @ 2.5'-4.0'		748.7	659.1	13.6%	5	972.0	223.3	109.1
40	B-11 @ 4.0'-5.5'		891.9	780.0	14.3%	6	1155.9	264.0	107.6
42	B-12 @ 0.2'-1.7'		800.6	751.7	6.5%	5	1019.0	218.4	124.5
43	B-12 @ 2.5'-4.0'		595.2	515.3	15.5%	4	772.4	177.2	106.7
44	B-12 @ 4.0'-5.5'		642.1	555.0	15.7%	4	820.9	178.8	114.9
46	B-13 @ 0.2'-1.7'		592.3	563.0	5.2%	4	765.8	173.5	116.5
47	B-13 @ 2.5'-4.0'		673.6	601.4	12.0%	5	895.9	222.3	99.6
48	B-13 @ 4.0'-5.5'		821.8	710.2	15.7%	5	1040.0	218.2	117.6
50	B-14 @ 0.2'-1.7'		804.0	704.0	14.2%	5	1022.4	218.4	116.6
51	B-14 @ 2.5'-4.0'		990.7	899.0	10.2%	6	1250.7	260.0	124.1
52	B-14 @ 4.0'-5.5'		822.0	749.3	9.7%	5	1043.1	221.1	124.1

REMARKS:



PROJECT: Shiprock Airstrip  
 LOCATION: Shiprock, New Mexico  
 SAMPLE DATE: 12/12/2016

PROJECT: 150133  
 WORK ORDER: 1610672  
 REVIEWED BY: J Floyd

DENSITY OF SOIL IN PLACE BY THE DRIVE-CYLINDER METHOD -- ASTM D 2937

LAB #	SAMPLE SOURCE	#REF1	MOISTURE			# OF RINGS	WET WEIGHT + RINGS (g)	WEIGHT OF RINGS (g)	DRY DENSITY (pcf)
			WET WEIGHT (g)	DRY WEIGHT (g)	MOISTURE CONTENT				
53	B-15 @ 0.2'-1.7'		637.8	573.0	11.3%	4	810.4	172.6	118.6
54	B-15 @ 2.5'-4.0'		821.7	733.0	12.1%	5	1033.7	212.0	121.4
55	B-15 @ 4.0'-5.5'		991.5	896.5	10.6%	6	1260.8	269.3	123.7
57	B-16 @ 0.2'-1.7'		737.6	705.2	4.6%	5	954.6	217.0	116.8
58	B-16 @ 2.5'-4.0'		777.1	678.1	14.6%	5	994.5	217.4	112.3
59	B-16 @ 4.0'-5.5'		830.5	731.1	13.6%	5	1045.4	214.9	121.1
60	B-17 @ 0.2'-1.7'		751.4	717.7	4.7%	5	974.0	222.6	118.9
61	B-17 @ 2.5'-4.0'		813.8	723.4	12.5%	5	1036.1	222.3	119.8
62	B-17 @ 4.0'-5.2'		674.9	608.0	11.0%	4	844.7	169.8	125.9
64	B-18 @ 0.3'-1.8'		615.7	586.4	5.0%	5	840.1	224.4	97.1
65	B-18 @ 2.5'-4.0'		906.3	779.9	16.2%	6	1169.3	263.0	107.6
66	B-18 @ 4.0'-5.5'		936.1	835.1	12.1%	6	1201.0	264.9	115.2
68	B-19 @ 0.2'-1.7'		613.7	581.7	5.5%	4	788.6	174.9	120.4
69	B-19 @ 2.5'-4.0'		958.8	837.7	14.5%	6	1230.0	271.2	115.6
70	B-19 @ 4.0'-4.9'		1,002.4	922.2	8.7%	6	1273.6	264.0	128.2
72	B-20 @ 0.2'-1.7'		799.8	757.4	5.6%	5	1008.3	208.5	125.4
73	B-20 @ 2.5'-4.0'		978.7	819.0	19.5%	6	1241.7	263.0	113.0
74	B-20 @ 4.0'-5.0'		963.9	893.3	7.9%	6	1226.0	262.1	123.3
75	B-21 @ 0.2'-1.7'		950.2	853.7	11.3%	6	1217.2	267.5	117.7
76	B-21 @ 2.5'-4.0'		765.6	646.6	18.4%	5	980.8	215.2	107.1
77	B-21 @ 4.0'-5.2'		837.9	755.5	10.9%	5	1056.0	218.1	125.1

REMARKS:



**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**SAMPLE DATE:** 12/12/2016

**PROJECT:** 150133  
**WORK ORDER:** 1610672  
**REVIEWED BY:** J Floyd

**DENSITY OF SOIL IN PLACE BY THE DRIVE-CYLINDER METHOD -- ASTM D 2937**

LAB #	SAMPLE SOURCE	#REF	MOISTURE			# OF RINGS	WET	WEIGHT OF RINGS (g)	DRY DENSITY (pcf)
			WET WEIGHT (g)	DRY WEIGHT (g)	MOISTURE CONTENT		WEIGHT + RINGS (g)		
79	B-22 @ 0.2'-1.7'		692.5	660.2	4.9%	5	911.2	218.7	109.3
80	B-22 @ 2.5'-4.0'		554.4	467.5	18.6%	5	769.4	215.0	77.4
81	B-22 @ 4.0'-5.5'		1,002.5	890.3	12.6%	6	1267.5	265.0	122.9
82	B-23 @ 0.2'-1.7'		962.9	881.8	9.2%	6	1233.6	270.7	121.7
83	B-23 @ 2.5'-4.0'		830.0	733.2	13.2%	5	1047.3	217.3	121.4
84	B-23 @ 4.0'-5.5'		935.6	839.9	11.4%	6	1200.0	264.4	115.9
87	B-24 @ 0.2'-1.7'		575.4	549.6	4.7%	4	756.4	181.0	113.8
88	B-24 @ 2.5'-4.0'		786.5	688.7	14.2%	5	1012.1	225.6	114.0
89	B-24 @ 4.0'-5.5'		802.4	706.3	13.6%	5	1018.0	215.6	117.0
90	B-25 @ 0.3'-1.8'		606.7	526.6	15.2%	4	781.7	175.0	109.0
91	B-25 @ 2.5'-4.0'		993.8	874.1	13.7%	6	1260.7	266.9	120.6
92	B-25 @ 4.0'-5.5'		779.2	716.8	8.7%	5	1002.2	223.0	118.7
94	B-26 @ 0.0'-1.5'		740.1	719.9	2.8%	5	985.7	218.6	123.6
95	B-26 @ 2.5'-3.4'		439.1	422.2	4.0%	3	575.1	136.0	116.5
96	B-26 @ 4.0'-4.5'		572.4	550.4	4.0%	4	755.8	178.4	114.9
97	B-27 @ 0.2'-1.7'		750.1	646.8	16.0%	5	975.0	224.1	107.2
98	B-27 @ 2.5'-4.0'		735.8	638.7	15.2%	5	953.8	218.0	105.8
99	B-27 @ 4.0'-5.5'		667.1	587.2	13.6%	4	837.8	176.7	120.5

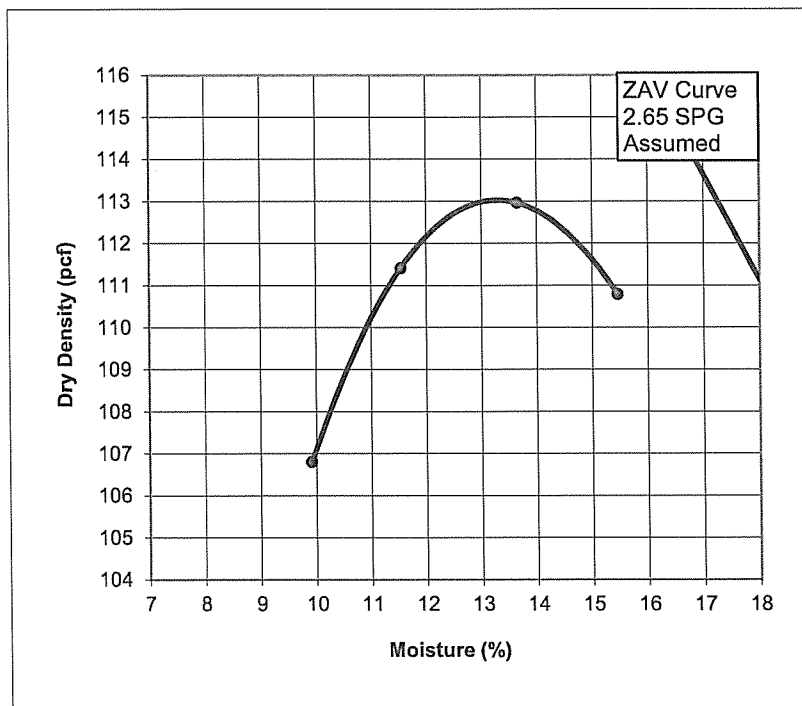
**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**MATERIAL:** Native  
**SAMPLE SOURCE:** Bulk Sample B-1 @ 0'-5'

**PROJECT NO:** 150133  
**WORK ORDER NO:** 1610672  
**LAB NO:** 1  
**SAMPLE DATE:** 12/12/2016

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING  
STANDARD EFFORT (12,400ft-lb-ft/cu.ft) (ASTMD698A)  
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)**

Maximum dry density:  
Optimum moisture (%):

English (pcf)	Metric (kg / cu.m.)
113.0	1810
13.3	13.3



SIEVE SIZE	PERCENT PASSING	SPECS.
6 in / 152mm	100	
4 in / 100mm	100	
3 in / 75mm	100	
2 in / 50mm	100	
1 1/2 in / 37.5mm	100	
1 1/4 in / 32 mm	100	
1 in / 25 mm	100	
3/4 in / 19 mm	100	
1/2 in / 12.5 mm	100	
3/8 in / 9.5 mm	100	
1/4 in / 6.4 mm	100	
#4, 4.75mm	100	
#8, 2.36mm	99	
#10, 2.00mm	99	
#16, 1.18mm	98	
#30, 0.60mm	96	
#40, .425mm	95	
#50, .300mm	94	
#100, .150mm	91	
#200, .075mm	84	

PL: 19  
PI: 10

USCS: CL  
AASHTO: A-4(7)

**NOTES:**

AASHTO Description: Silty soils

- The zero air void curve represents a specific gravity of: 2.65 assumed, (also used in the 'Rock Correction Calculation)
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.
- The "Rock Correction" is based on the sieve performed for this sample

Reviewed by: J Floyd

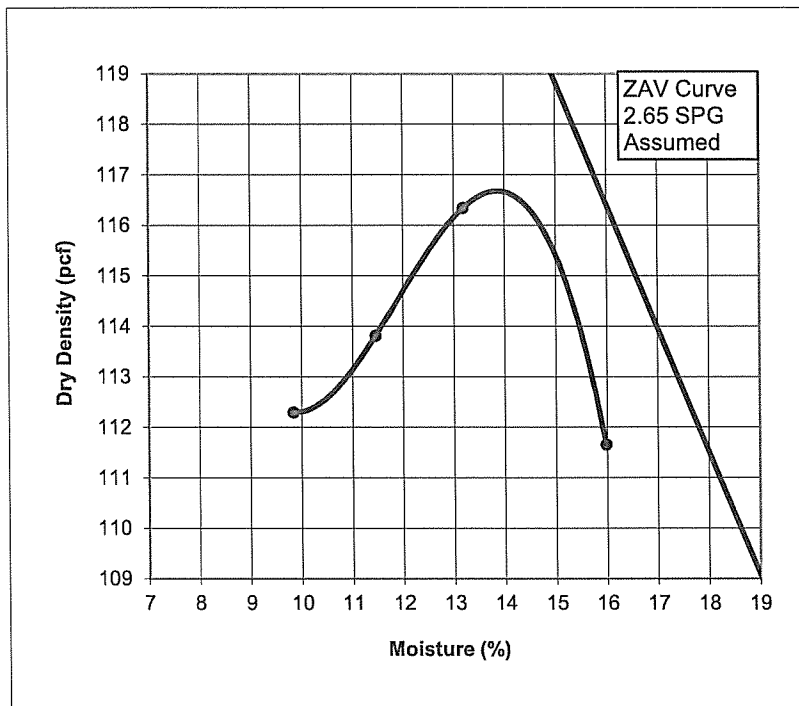
**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**MATERIAL:** Native  
**SAMPLE SOURCE:** Bulk Sample B-7 @ 0'-5'

**PROJECT NO:** 150133  
**WORK ORDER NO:** 1610672  
**LAB NO:** 23  
**SAMPLE DATE:** 12/12/2016

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING  
STANDARD EFFORT (12,400ft-lb-ft/cu.ft) (ASTMD698A)  
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)**

Maximum dry density:  
Optimum moisture (%):

English (pcf)	Metric (kg / cu.m.)
116.7	1869
13.9	13.9



SIEVE SIZE	PERCENT PASSING	SPECS
6 in / 152mm	100	
4 in / 100mm	100	
3 in / 75mm	100	
2 in / 50mm	100	
1 1/2 in / 37.5mm	100	
1 1/4 in / 32 mm	100	
1 in / 25 mm	100	
3/4 in / 19 mm	100	
1/2 in / 12.5 mm	100	
3/8 in / 9.5 mm	100	
1/4 in / 6.4 mm	100	
#4, 4.75mm	100	
#8, 2.36mm	97	
#10, 2.00mm	96	
#16, 1.18mm	94	
#30, 0.60mm	92	
#40, .425mm	91	
#50, .300mm	89	
#100, .150mm	87	
#200, .075mm	82	

PL: 23  
PI: 9

USCS: CL  
AASHTO: A-4(7)

**NOTES:**

AASHTO Description: Silty soils

- The zero air void curve represents a specific gravity of: 2.65 assumed, (also used in the 'Rock Correction Calculation)
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.
- The "Rock Correction" is based on the sieve performed for this sample

Reviewed by: J Floyd

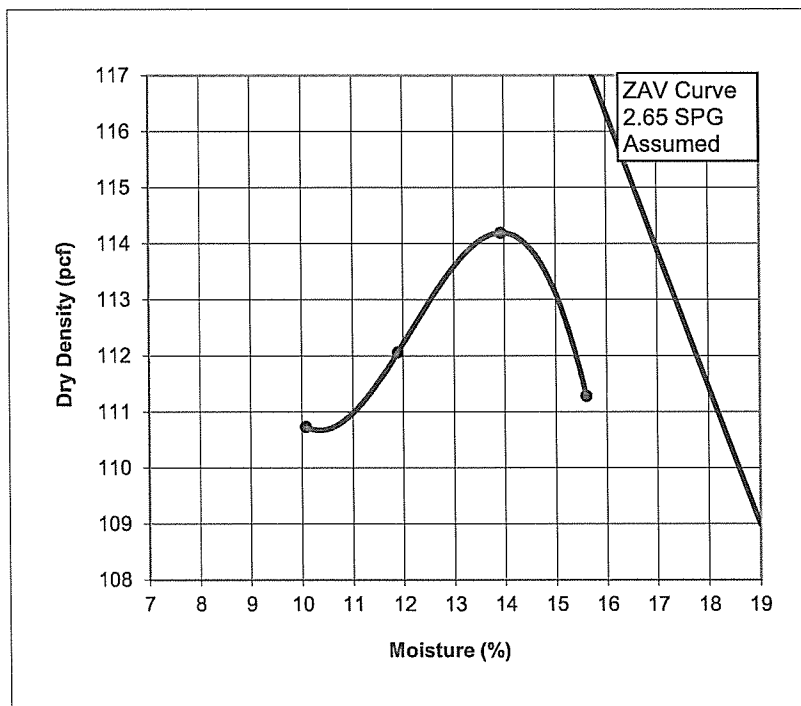
**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**MATERIAL:** Native  
**SAMPLE SOURCE:** Bulk Sample B-13, 0'-5'

**PROJECT NO:** 150133  
**WORK ORDER NO:** 1610672  
**LAB NO:** 45  
**SAMPLE DATE:** 12/12/2016

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING  
STANDARD EFFORT (12,400ft-lb-ft/cu.ft) (ASTMD698A)  
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)**

Maximum dry density:  
Optimum moisture (%):

English (pcf)	Metric (kg / cu.m.)
114.2	1829
13.9	13.9



SIEVE SIZE	PERCENT PASSING	SPECS
6 in / 152mm	100	
4 in / 100mm	100	
3 in / 75mm	100	
2 in / 50mm	100	
1 1/2 in / 37.5mm	100	
1 1/4 in / 32 mm	100	
1 in / 25 mm	100	
3/4 in / 19 mm	100	
1/2 in / 12.5 mm	100	
3/8 in / 9.5 mm	100	
1/4 in / 6.4 mm	100	
#4, 4.75mm	100	
#8, 2.36mm	99	
#10, 2.00mm	99	
#16, 1.18mm	99	
#30, 0.60mm	98	
#40, .425mm	97	
#50, .300mm	96	
#100, .150mm	93	
#200, .075mm	88	

PL: 18  
PI: 12

USCS: CL  
AASHTO: A-6(9)

NOTES:

AASHTO Description: Clayey soils

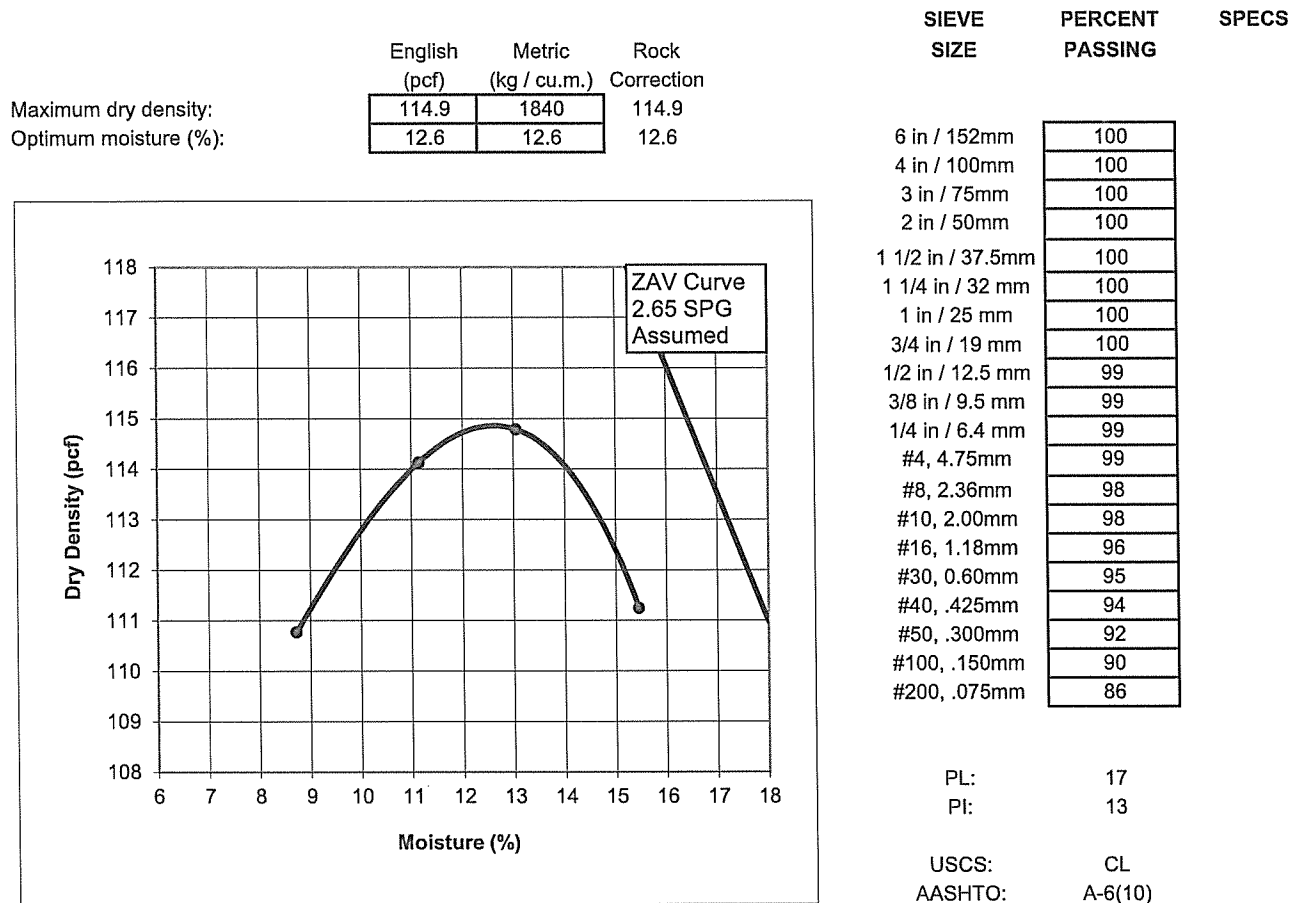
- The zero air void curve represents a specific gravity of: 2.65 assumed, (also used in the 'Rock Correction Calculation)
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.
- The "Rock Correction" is based on the sieve performed for this sample

Reviewed by: J Floyd

**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**MATERIAL:** Native  
**SAMPLE SOURCE:** Bulk Sample B-19, 0'-5'

**PROJECT NO:** 150133  
**WORK ORDER NO:** 1610672  
**LAB NO:** 67  
**SAMPLE DATE:** 12/12/2016

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING  
STANDARD EFFORT (12,400ft-lb-ft/cu.ft) (ASTMD698A)  
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)**



**NOTES:**

AASHTO Description: Clayey soils

- The zero air void curve represents a specific gravity of: 2.65 assumed, (also used in the 'Rock Correction Calculation)
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.
- The "Rock Correction" is based on the sieve performed for this sample

Reviewed by: J Floyd

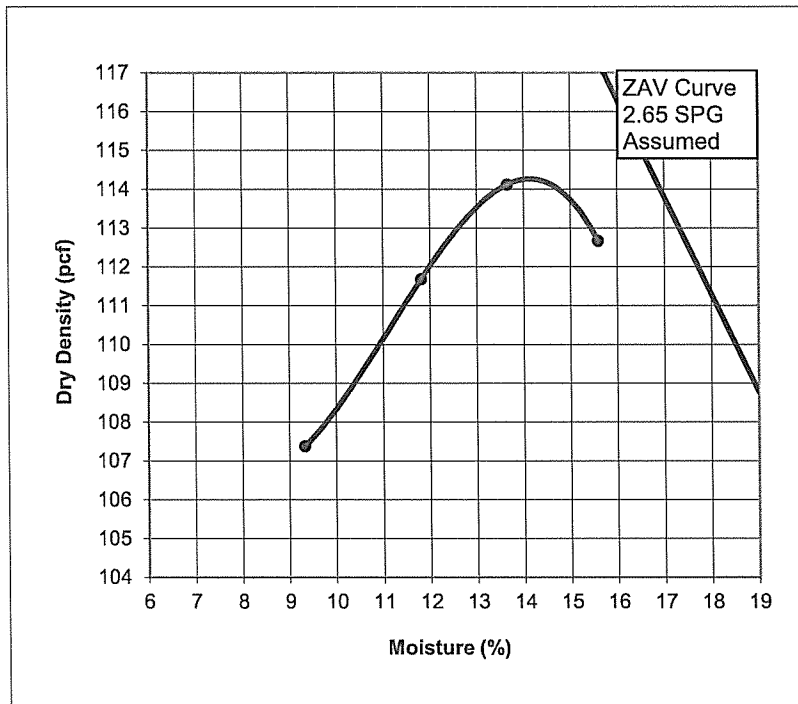
**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**MATERIAL:** Native  
**SAMPLE SOURCE:** Bulk Sample B-24, 0'-5'

**PROJECT NO:** 150133  
**WORK ORDER NO:** 1610672  
**LAB NO:** 86  
**SAMPLE DATE:** 12/12/2016

**LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING  
STANDARD EFFORT (12,400ft-lb-ft/cu.ft) (ASTMD698A)  
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)**

Maximum dry density:  
Optimum moisture (%):

English (pcf)	Metric (kg / cu.m.)
114.3	1830
14.1	14.1



SIEVE SIZE	PERCENT PASSING	SPECS
6 in / 152mm	100	
4 in / 100mm	100	
3 in / 75mm	100	
2 in / 50mm	100	
1 1/2 in / 37.5mm	100	
1 1/4 in / 32 mm	100	
1 in / 25 mm	100	
3/4 in / 19 mm	100	
1/2 in / 12.5 mm	100	
3/8 in / 9.5 mm	100	
1/4 in / 6.4 mm	100	
#4, 4.75mm	100	
#8, 2.36mm	99	
#10, 2.00mm	98	
#16, 1.18mm	97	
#30, 0.60mm	95	
#40, .425mm	94	
#50, .300mm	93	
#100, .150mm	90	
#200, .075mm	85	

PL: 17  
PI: 12

USCS: CL  
AASHTO: A-6(9)

**NOTES:**

AASHTO Description: Clayey soils

- The zero air void curve represents a specific gravity of: 2.65 assumed, (also used in the 'Rock Correction Calculation)
- This is a summarized report of the referenced procedures and does not include all reporting requirements. Additional data can be provided at clients request.
- The "Rock Correction" is based on the sieve performed for this sample

Reviewed by: J Floyd

## Soil Analysis Report

Atek Engineering Consultants  
James Floyd  
111 South Weber Drive, Suite 1  
Chandler, AZ 85226

Project: 150133  
Sampler:  
Date Received: 12/29/2016  
Date Reported: 1/5/2017  
PO Number: 1610672

**Lab Number: 919846-01      1 B-1**

<i>Sulfate (ARIZ 733)</i>	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	5086	ppm	
Sulfate 0.51%				

**Lab Number: 919846-02      23 B-7**

<i>Sulfate (ARIZ 733)</i>	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	5707	ppm	
Sulfate 0.57%				

**Lab Number: 919846-03      45 B-13**

<i>Sulfate (ARIZ 733)</i>	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	5057	ppm	
Sulfate 0.0.51%				

**Lab Number: 919846-04      67 B-19**

<i>Sulfate (ARIZ 733)</i>	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	6084	ppm	
Sulfate 0.61%				

**Lab Number: 919846-05      86 B-24**

<i>Sulfate (ARIZ 733)</i>	Method	Result	Units	Levels
Sulfate, SO4	ARIZ 733	6378	ppm	
Sulfate 0.64%				

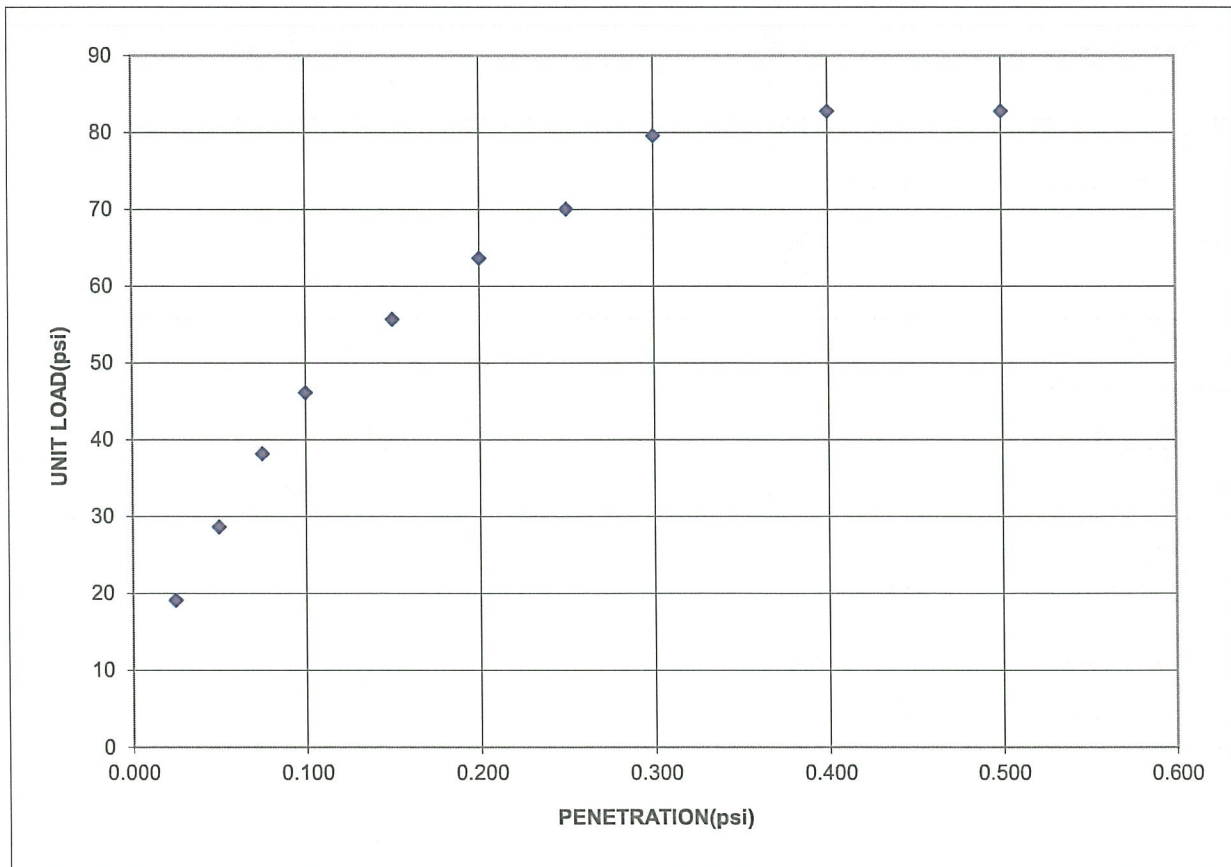
**PROJECT:** Shiprock Airstrip  
**LOCATION:** Shiprock, New Mexico  
**MATERIAL:** Native  
**SAMPLE SOURCE:** Bulk Sample B-1 @ 0'-5'  
**REVIEWED BY:** J Floyd

**PROJECT NO:** 150133  
**WORK ORDER NO:** 1610672  
**LAB NO:** 86  
**DATE SAMPLED:** 12/12/2016

**CBR(CALIFORNIA BEARING RATIO) OF LABORATORY-COMPACTED SOILS (ASTM D1883)**

COMPACTION(%)	95.9			
COMPACTION:	LIFTS @	BLOWS/LIFT	PENETRATION	CORRECTED C B R
PERCENT SWELL	1.51%		0.100	5
			0.200	4

	BEFORE SOAK	AFTER SOAK	ASTM D 1557 A PROCTOR
DRY DENSITY	105.3 lbs./cu.ft	104.8 lbs./cu.ft	DRY DENSITY(pcf) 109.8
PERCENT MOISTURE	13.3 %	20.6 %	MOISTURE(%) 13.3
SURCHARGE WEIGHT	10 lbs.		



CBR 4.6

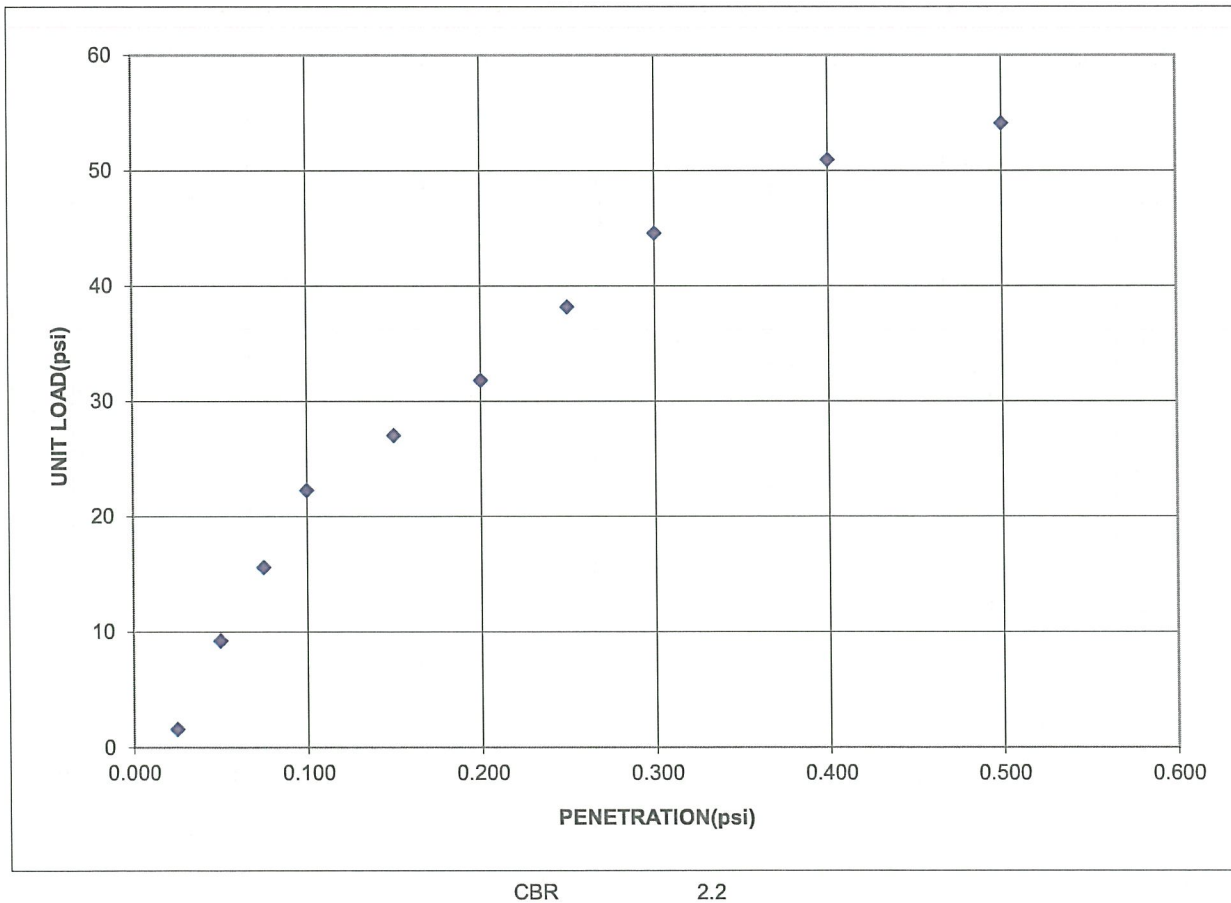
PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, New Mexico  
MATERIAL: Native  
SAMPLE SOURCE: Bulk Sample B-7 @ 0'-5'  
REVIEWED BY: J Floyd

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
LAB NO: 23  
DATE SAMPLED: 12/12/2016

**CBR(CALIFORNIA BEARING RATIO) OF LABORATORY-COMPACTED SOILS (ASTM D1883)**

COMPACTION(%)	99.5		
COMPACTION:	LIFTS @	BLOWS/LIFT	
PERCENT SWELL	1.66%		
		PENETRATION	CORRECTED C B R
		0.100	2
		0.200	2

	BEFORE SOAK	AFTER SOAK	
DRY DENSITY	109.2 lbs./cu.ft	109.1 lbs./cu.ft	
PERCENT MOISTURE	13.8 %	19.3 %	
			ASTM D 1557 A PROCTOR
			DRY DENSITY(pcf) 109.8
			MOISTURE(%) 13.3
SURCHARGE WEIGHT	10 lbs.		



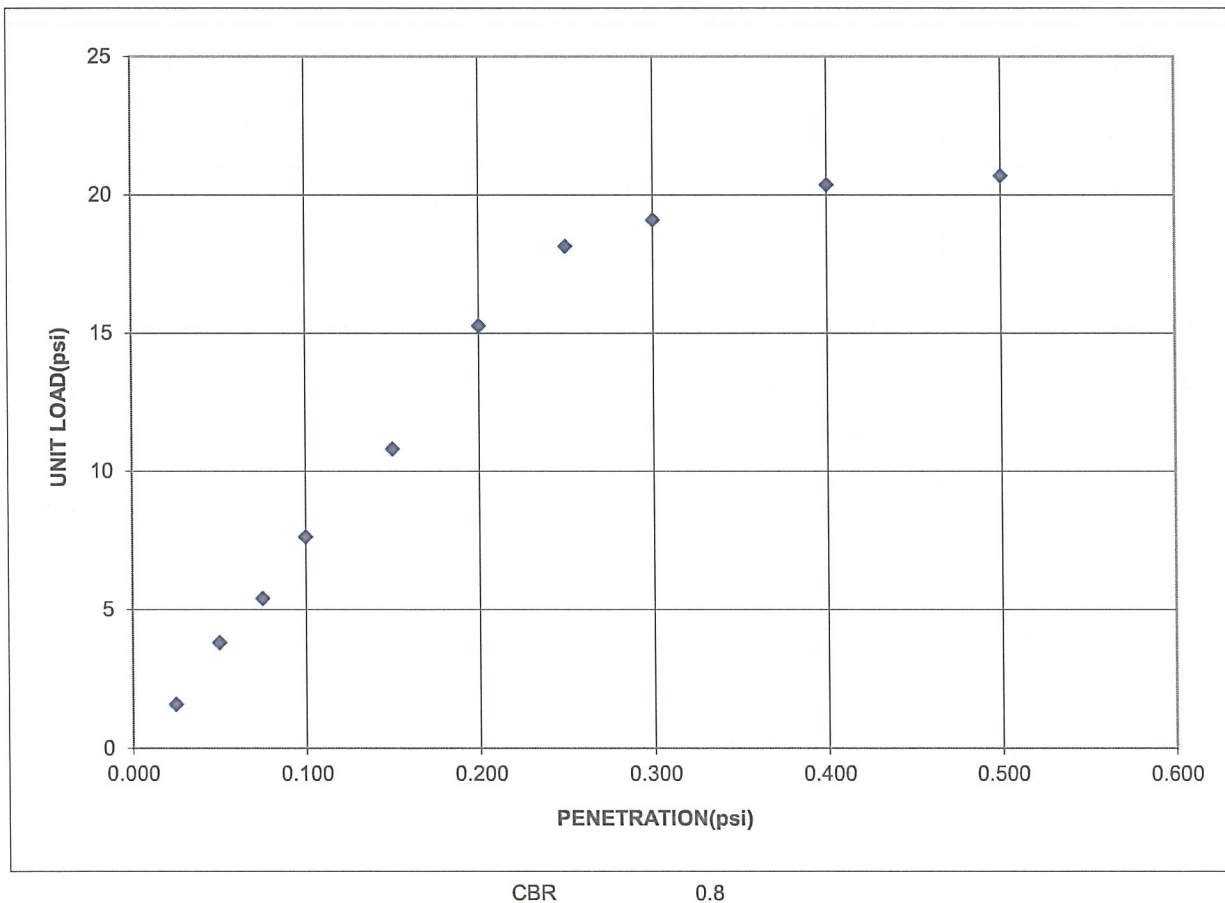
PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, New Mexico  
MATERIAL: Native  
SAMPLE SOURCE: Bulk Sample B-13 @ 0'-5'  
REVIEWED BY: J Floyd

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
LAB NO: 45  
DATE SAMPLED: 12/12/2016

**CBR(CALIFORNIA BEARING RATIO) OF LABORATORY-COMPACTED SOILS (ASTM D1883)**

COMPACTION(%)	95.9			
COMPACTION:	LIFTS @	BLOWS/LIFT	PENETRATION	CORRECTED C B R
PERCENT SWELL	1.57%		0.100	1
			0.200	1

	BEFORE SOAK	AFTER SOAK	ASTM D 1557 A PROCTOR
DRY DENSITY	105.3 lbs./cu.ft	105.3 lbs./cu.ft	DRY DENSITY(pcf) 109.8
PERCENT MOISTURE	13.6 %	21.6 %	MOISTURE(%) 13.3
SURCHARGE WEIGHT	10 lbs.		



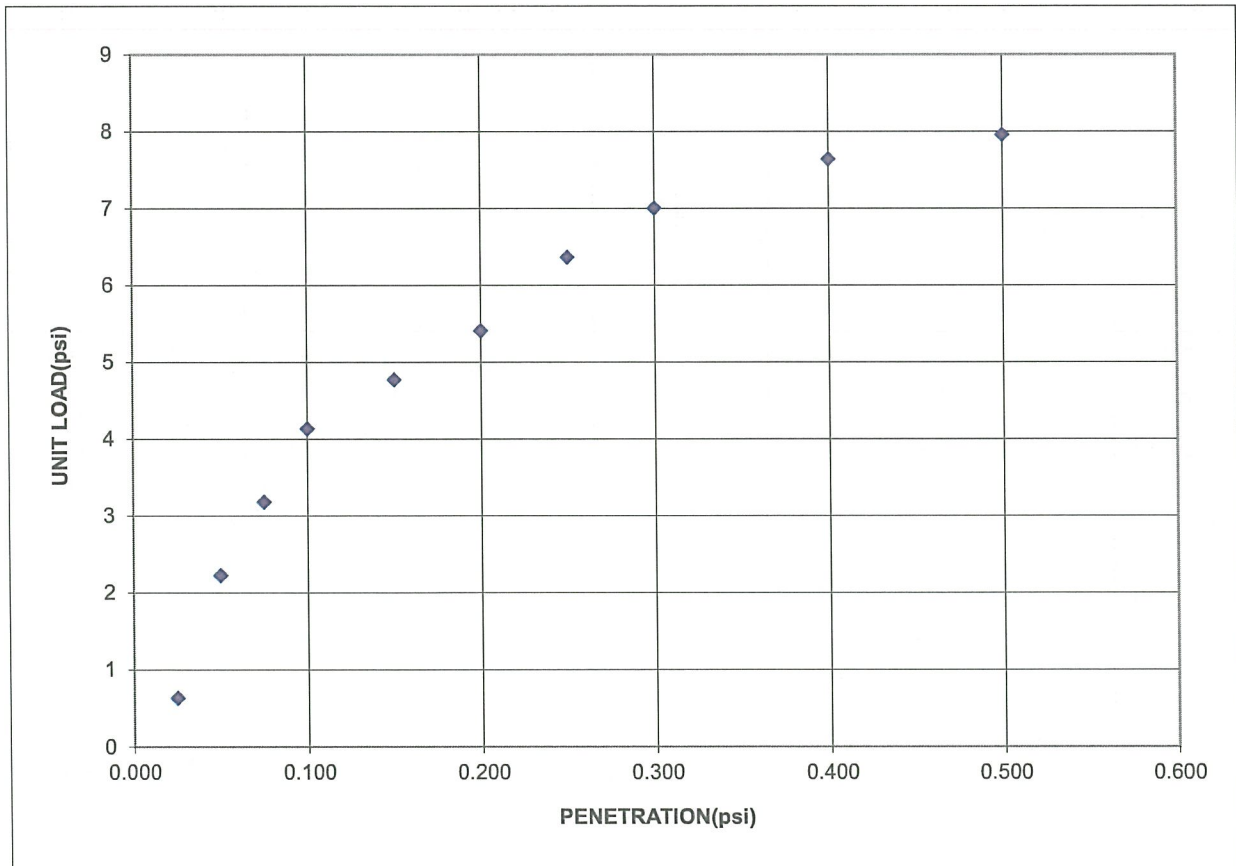
PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, New Mexico  
MATERIAL: Native  
SAMPLE SOURCE: Bulk Sample B-19 @ 0'-5'  
REVIEWED BY: J Floyd

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
LAB NO: 19  
DATE SAMPLED: 12/12/2016

**CBR(CALIFORNIA BEARING RATIO) OF LABORATORY-COMPACTED SOILS (ASTM D1883)**

COMPACTION(%)	99.8		
COMPACTION:	LIFTS @ BLOWS/LIFT	PENETRATION	CORRECTED C B R
PERCENT SWELL	2.90%	0.100	0.4
		0.200	0.4

	BEFORE SOAK	AFTER SOAK	
DRY DENSITY	109.6 lbs./cu.ft	109.6 lbs./cu.ft	ASTM D 1557 A PROCTOR
PERCENT MOISTURE	10.5 %	18.8 %	DRY DENSITY(pcf) 109.8
			MOISTURE(%) 13.3
SURCHARGE WEIGHT	10 lbs.		



CBR 0.4

PROJECT: Shiprock Airstrip  
LOCATION: Shiprock, New Mexico  
MATERIAL: Native  
SAMPLE SOURCE: Bulk Sample B-24 @ 0'-5'  
REVIEWED BY: J Floyd

PROJECT NO: 150133  
WORK ORDER NO: 1610672  
LAB NO: 86  
DATE SAMPLED: 12/12/2016

**CBR(CALIFORNIA BEARING RATIO) OF LABORATORY-COMPACTED SOILS (ASTM D1883)**

COMPACTION(%)	97.0			
COMPACTION:	LIFTS @	BLOWS/LIFT	PENETRATION	CORRECTED C B R
PERCENT SWELL	2.20%		0.100	3
			0.200	2

	BEFORE SOAK	AFTER SOAK	
DRY DENSITY	106.5 lbs./cu.ft	106.8 lbs./cu.ft	ASTM D 1557 A PROCTOR
PERCENT MOISTURE	14.2 %	19.9 %	DRY DENSITY(pcf) 109.8
			MOISTURE(%) 13.3
SURCHARGE WEIGHT	10 lbs.		

